

2.14 Radioactive Liquid Waste Treatment Facility (TA-50)

The RLWTF is located at TA-50 and consists of the treatment facility (Building 50-01), support buildings, and liquid and chemical storage tanks. The primary activity is the treatment of liquid wastes generated at other LANL facilities, but decontamination of equipment and waste items is also performed. There are four Category 3 nuclear structures at this Key Facility – the RLWTF itself (Building 50-01), the tank farm and pumping station (50-02), the acid and caustic solution tank farm (50-66), and a 100,000-gallon influent holding tank (50-90). There are no other nuclear facilities, and no Moderate Hazard nonnuclear buildings within this Key Facility. Five capabilities were identified in the SWEIS.

2.14.1 RLWTF Construction and Modifications

The new UF/RO (ultrafiltration and reverse osmosis) process was installed in 1998 and became operational March 22, 1999. Similarly, nitrate reduction equipment was installed in 1998 and became operational on March 15, 1999. These modifications contributed to improved effluent quality. There were zero violations of the new State of New Mexico discharge limit for nitrates (10 mg/L) from March through the end of 1999. And despite a longer break-in period for the UF/RO equipment, all discharges were below DOE's guidelines for radioactivity beginning December 10, 1999.

While enabling the RLWTF to meet all discharge limits and guidelines, the UF/RO equipment introduced significant process difficulties. In order to overcome the process difficulties, facility personnel installed an electrodialysis reversal unit and began construction of an evaporator in the autumn. Both units are designed to process the waste stream from the reverse osmosis unit. The SWEIS ROD projected neither of these facility modifications. They received NEPA review, however, through Categorical Exclusions (#7428, approved February 23, 1999, and #7737, approved October 29, 1999, respectively).

2.14.2 RLWTF Capabilities

The SWEIS identified five capabilities for the RLWTF Key Facility. No new capabilities were added in 1999, and none were deleted. The primary measurement of activity for this facility is the volume of RLW processed through the main treatment equipment. In 1999, this volume was 20 million liters of treated RLW discharged to Mortandad Canyon, which is less than the discharge volume of 35 million liters per year projected in the SWEIS ROD. As seen in Table 2.14.2-1, other operations at the RLWTF were also below levels projected by the ROD.



Top: Removal of ion exchange column to make room for new membrane treatment processes

Middle: View of the new tubular ultrafilter

Bottom: View of the new tubular ultrafilter and motor control center

Table 2.14.2-1. RLWTF (TA-50)/Comparison of Operations

CAPABILITY	SWEIS ROD ^a	1999 OPERATIONS
Waste Characterization, Packaging, Labeling	Support, certify, and audit generator characterization programs. Maintain waste acceptance criteria for radioactive liquid waste treatment facilities.	As projected. As projected.
Waste Transport, Receipt, and Acceptance	Collect RLW from generators and transport to TA-50.	As projected.
RLW Pretreatment	Pretreat 900,000 liters/yr of RLW at TA-21. Pretreat 80,000 liters/yr of RLW from TA-55 in Room 60. Solidify, characterize, and package 3 m ³ /yr of TRU waste sludge in Room 60.	Pretreated 45,000 liters at TA-21. Pretreated less than 80,000 liters/yr of radioactive liquid waste from TA-55 in Room 60. Solidified 5 m ³ of TRU waste sludge in Room 60.
RLW Treatment	Install UF/RO equipment in 1997. Install equipment for nitrate reduction in 1999. Treat 35 million liters/yr of radioactive liquid waste. De-water, characterize, and package 10 m ³ /yr of LLW sludge. Solidify, characterize, and package 32 m ³ /yr of TRU waste sludge.	UF/RO equipment installed 1998, and operational in March 1999. Nitrate reduction equipment installed 1998; operational March 1999. Treated 20 million liters of RLW. De-watered 37 m ³ of LLW sludge. No TRU waste sludge was solidified.
Decontamination Operations	Decontaminate LANL personnel respirators for reuse (approximately 700/month). Decontaminate air-proportional probes for reuse (approximately 300/month). Decontaminate vehicles and portable instruments for reuse (as required). Decontaminate precious metals for resale (acid bath). Decontaminate scrap metals for resale (sand blast). Decontaminate 200 m ³ of lead for reuse (grit blast).	Decontaminated 425 personnel respirators per month. Decontaminated 93 faces and 94 bodies per month (air-proportional probes). Decontaminated 26 drill bits, 12 augers, four collars, and six portable instruments per month. Decontaminated platinum from TRU waste to LLW. Decontaminated no scrap metals. Decontaminated 2.3 m ³ of lead.

^a Includes installation of UF/RO and nitrate reduction processes in Building 50-01 and installation of above ground tanks for the collection of influent RLW.

2.14.3 Operations Data for the RLWTF

Although levels of operation were less than projected in the SWEIS, only some consequences were lower than projected. Radioactive air emissions continued to be negligible (less than one microcurie). NPDES discharge volume was 5.3 million gallons compared to a projected 9.3 million gallons, and chemical waste was one-tenth of projections (201 kilograms/year compared to 2200 kilograms/year). TRU/mixed TRU waste quantities were also less than projected (4.6 cubic meters per year compared to 30 cubic meters per year). However, LLW and MLLW exceeded projections. Table 2.14.3-1 provides details.

Table 2.14.3-1. RLWTF (TA-50)/Operations Data

PARAMETER	UNITS	SWEIS ROD	1999 OPERATIONS
Radioactive Air Emissions:			
Americium-241	Ci/yr	Negligible	1.3E-7
Plutonium-238	Ci/yr	Negligible	3.4E-8
Plutonium-239	Ci/yr	Negligible	1.8E-8
Thorium-230	Ci/yr	Negligible	3.7E-8
Uranium-234	Ci/yr	Negligible	None detected ^a
NPDES Discharge: 051	MGY	9.3	5.3
Wastes:			
Chemical	kg/yr	2200	201
LLW	m ³ /yr	160	176
MLLW	m ³ /yr	0	3.2
TRU/Mixed TRU	m ³ /yr	30	4.6
TRU	m ³ /yr	30	0
Mixed TRU	m ³ /yr	0	4.6
Number of Workers	FTEs	110	62 ^b

^a Although stack sampling systems were in place to measure these emissions, any emissions were sufficiently small to be below the detection capabilities of the sampling systems.

^b The number of employees for 1999 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1999 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (see Section 4.6, Socioeconomics) is not appropriate.

2.15 Solid Radioactive and Chemical Waste Facilities (TA-50 and TA-54)

The Solid Radioactive and Chemical Waste Key Facility is located at TAs 50 and 54. Activities are all related to the management (packaging, characterization, receipt, transport, storage, and disposal) of radioactive and chemical wastes generated at other LANL facilities.

The Solid Radioactive and Chemical Waste Facilities have numerous nuclear facilities on site. According to the DOE "List of Los Alamos National Laboratory Nuclear Facilities," December 1998, there are eight Category 2 nuclear buildings: the Radioactive Materials Research Operations and Demonstration Facility (Building 50-37); the liquid waste tank (Structure 50-190) at the Waste Characterization, Reduction, and Repackaging Facility (WCRRF); and six fabric domes at TA-54 for the storage of retrieved TRU wastes (Domes 226, 229–232, and 375).

There are also six Category 3 nuclear buildings within this Key Facility: the Radioactive Assay and Nondestructive Test Facility (Building 54-38); WCRRF itself (Building 50-69); and four fabric domes for the storage of TRU wastes (Domes 54-048, -049, -153, and -283).

In addition, the LLW disposal cells, shafts, and trenches are listed in the December 1998 DOE list as a Category 2 "facility." There are no Moderate Hazard nonnuclear buildings within this Key Facility.

Several changes were made to the status of nuclear facility classifications, and several nuclear facilities were added to this Key Facility. However, these changes were not incorporated in the December 1998 DOE List of Los Alamos National Laboratory Nuclear Facilities and therefore are not reported here. Once the DOE list is updated, those changes will be reflected in the appropriate SWEIS Yearbook.

2.15.1 Construction and Modifications at the Solid Radioactive and Chemical Waste Facility

The construction of a new TRU waste storage dome (54-375) was completed in calendar year 1999. In addition, construction of the Decontamination and Volume Reduction Systems (DVRS) began in calendar year 1999. The DVRS is designed to segregate, decontaminate, and volume-reduce old TRU waste packages thereby resulting in efficient, WIPP-compliant TRU packages. As an added benefit, a major fraction of the historical waste packaging and secondary waste is anticipated to be LLW, and thus will not need to be shipped to WIPP for disposal. An environmental assessment was prepared (DOE 1999d) and a Finding of No Significant Impact was issued on June 25, 1999.

2.15.2 Operations at the Solid Radioactive and Chemical Waste Facility

The SWEIS identified eight capabilities for this Key Facility. No new capabilities have been added, and none have been deleted. The primary measurements of activity for this facility are the volumes of newly generated chemical, low-level, and TRU wastes to be managed and the volumes of legacy TRU waste and MLLW in storage. A comparison of calendar year 1999 to projections made by the ROD can be summarized as follows:

Chemical wastes: A total of 882 metric tons were shipped for off-site treatment and/or disposal, compared to an average quantity of 3250 metric tons per year projected by the ROD.

LLW: A total of 1320 cubic meters were placed into disposal cells and shafts at Area G, compared to an average volume of 12,230 cubic meters per year projected by the ROD. No new disposal cells were constructed, and disposal operations did not expand into either Zone 4 or Zone 6 at TA-54. Operations are not expected to expand for at least another three years.

MLLW: A total of 96 cubic meters (13 newly generated and 83 legacy) were shipped for off-site treatment and/or disposal, compared to an average volume of 632 cubic meters per year projected by the ROD. The ROD projected that the inventory of legacy mixed wastes would be reduced to zero by 2006.

TRU wastes: In calendar year 1999, 192 cubic meters of newly generated TRU wastes were added to storage. Additionally, 244 cubic meters have also been added to storage because of the Transuranic Waste Inspectable Storage Project (TWISP). In March of 1998, TWISP completed retrieving drums from Pad 1. The project started retrieving drums from Pad 4 in December 1998 and finished retrieval in December 1999. Retrieval of drums from Pad 2 is expected to start in calendar year 2000. In 1999, TWISP operations recovered 2195 cubic meters, and as of December 1999, a total of 4146 cubic meters had been recovered. The ROD projects that TWISP will retrieve all 4700 cubic meters from underground pads by December 2004.

Legacy TRU waste shipments to WIPP began on March 26, 1999. In calendar year 1999 there were 17 shipments of TRU waste to WIPP. The amount of material that was removed from LANL inventory was equivalent to 30 drums. However, because of the wattage of the material, the 30 drums were repackaged into 102 drums. Each of the 102 drums was then placed into a standard waste box. Each of the 17 shipments consisted of six standard waste boxes.

In summary, chemical and radioactive waste management activities were at levels below those projected by the ROD. These and other operational details appear in Table 2.15.2-1. The one anomaly that should be mentioned is the 4003 cubic meters of solid wastes disposed in pits at Area J. These administratively controlled wastes resulted from Environmental Restoration (ER) Project remedial activities at Material Disposal Area (MDA) P, and far exceeded the projections of 100 cubic meters per year. However, this material was nonhazardous wastes, soil, concrete rubble, and debris placed in MDA-J as fill in preparation of capping (1999 Annual Report Questionnaire for the Los Alamos National Laboratory, Technical Area 54, Area J Landfill).

Table 2.15.2-1. Solid Radioactive and Chemical Waste Facilities (TA-54 and TA-50) / Comparison of Operations

CAPABILITY	SWEIS ROD ^a	1999 OPERATIONS
Waste Characterization, Packaging, and Labeling	<p>Support, certify, and audit generator characterization programs.</p> <p>Maintain waste acceptance criteria for LANL waste management facilities.</p> <p>Characterize 760 m³ of legacy MLLW.</p> <p>Characterize 9010 m³ of legacy TRU waste.</p> <p>Verify characterization data at the Radioactive Assay and Nondestructive Test Facility for unopened containers of LLW and TRU waste.</p> <p>Maintain waste acceptance criteria for off-site treatment, storage, and disposal facilities.</p> <p>Overpack and bulk waste as required.</p> <p>Perform coring and visual inspection of a percentage of TRU waste packages.</p> <p>Ventilate 16,700 drums of TRU waste retrieved during TWISP.</p> <p>Maintain current version of WIPP waste acceptance criteria and liaison with WIPP operations.</p>	<p>Activities were as projected in the SWEIS ROD with the following differences:</p> <p>Characterized 83 m³ of legacy MLLW in 1999.</p> <p>Characterized 6.25 m³ of legacy TRU waste during 1999.</p> <p>Verified characterization data at Radioactive Assay and Nondestructive Test Facility for TRU wastes, but not for LLW.</p> <p>Six drums were cored and inspected in calendar year 1999.</p> <p>Ventilated 8426 drums as of December 1999.</p>
Compaction	Compact up to 25,400 m ³ of LLW.	280 m ³ compacted into 77 m ³ LLW.
Size Reduction	Size reduce 2900 m ³ of TRU waste at WCRRF and the Drum Preparation Facility.	Size reduction was not performed in 1999.
Waste Transport, Receipt, and Acceptance	Collect chemical and mixed wastes from LANL generators and transport to TA-54.	Collected and transported chemical and mixed wastes.
	<p>Begin shipments to WIPP in 1999.</p> <p>Over the next 10 years:</p> <p>Ship 32,000 metric tons of chemical wastes and 3640 m³ of MLLW for off-site land disposal restrictions, treatment, and disposal.</p> <p>Ship no LLW for off-site disposal.</p> <p>Ship 9010 m³ of legacy TRU waste to WIPP.</p> <p>Ship 5460 m³ of operational and environmental restoration TRU waste to WIPP.</p> <p>Ship no environmental restoration soils for off-site solidification and disposal.</p>	<p>Shipments to WIPP began 3/26/1999.</p> <p>Shipments in 1999:</p> <p>882 metric tons of chemical wastes and 96 m³ of MLLW for off-site treatment and disposal.</p> <p>No LLW for off-site disposal.</p> <p>6.25 m³ of legacy TRU waste was shipped in 1999.</p> <p>No operational or environmental restoration TRU wastes shipped to WIPP.</p> <p>No environmental restoration soils for solidification and disposal.</p>

CAPABILITY	SWEIS ROD ^a	1999 OPERATIONS
Waste Transport, Receipt, and Acceptance (Cont.)	Annually receive, on average, 5 m ³ of LLW and TRU waste from off-site locations in 5 to 10 shipments.	No LLW or TRU waste receipts from off-site locations.
Waste Storage	Stage chemical and mixed wastes before shipment for off-site treatment, storage, and disposal.	Chemical and mixed wastes staged before shipment.
	Store legacy TRU waste and MLLW.	Legacy TRU waste and MLLW stored.
	Store LLW uranium chips until sufficient quantities have accumulated for stabilization.	LANL still generates this waste; however, TA-54 no longer accepts them for storage. The generator is required to process this waste to make it acceptable for disposal at TA-54.
Waste Retrieval	Begin retrieval operations in 1997.	Retrieval begun in 1997.
	Retrieve 4700 m ³ of TRU waste from Pads 1, 2, 4 by 2004.	Retrieved 2195 m ³ in calendar year 1999. Retrieved 4146 m ³ total through Dec. 1999.
Other Waste Processing	Demonstrate treatment (e.g., electrochemical) of MLLW liquids.	No activity.
	Land farm oil-contaminated soils at Area J.	No oil-contaminated soils were land-farmed.
	Stabilize 870 m ³ of uranium chips.	No uranium chips stabilized in 1999.
	Provide special-case treatment for 1030 m ³ of TRU waste.	None.
	Solidify 2850 m ³ of MLLW (environmental restoration soils) for disposal at Area G.	No environmental restoration soils solidified.
Disposal	Over next 10 years: Dispose of 420 m ³ of LLW in shafts at Area G. Dispose of 115,000 m ³ of LLW in disposal cells at Area G. (Requires expansion of on-site LLW disposal operations beyond existing Area G footprint.) Dispose of 100 m ³ /yr administratively controlled industrial solid wastes in pits at Area J. Dispose of nonradioactive classified wastes in shafts at Area J.	During 1999: 23 m ³ of LLW were disposed in shafts at Area G. 1320 m ³ of LLW disposed in cells. Area G was not expanded. 4003 m ³ solid wastes disposed in pits at Area J. ^b 0.28 m ³ of classified solid wastes disposed in shafts at Area J.

^a Includes the construction of four new storage domes for the TWISP.

^b This volume exceeds projections because of excavation of MDA-P by the ER Project.

2.15.3 Operations Data for the Solid Radioactive and Chemical Waste Facility

Levels of operation in 1999 were less than projected by the ROD for air emissions and most wastes. However, TRU/mixed TRU waste quantities were higher than those projected. Table 2.15.3-1 provides details.

**Table 2.15.3-1. Solid Radioactive and Chemical Waste Facilities (TA-54 and TA-50)
Operations Data**

PARAMETER	UNITS	SWEIS ROD	1999 OPERATIONS
Radioactive Air Emissions: ^a			
Tritium	Ci/yr	6.09E+1	^a
Americium-241	Ci/yr	6.60E-7	^a
Plutonium-238	Ci/yr	4.80E-6	9.9E-11
Plutonium-239	Ci/yr	6.80E-7	^a
Uranium-234	Ci/yr	8.00E-6	1.7E-8
Uranium-235	Ci/yr	4.10E-7	^a
Uranium-238	Ci/yr	4.00E-6	2.3E-9
NPDES Discharge	MGY	No outfalls	No outfalls
Wastes: ^b			
Chemical	kg/yr	920	30
LLW	m ³ /yr	174	21
MLLW	m ³ /yr	4	0
TRU/Mixed TRU	m ³ /yr	27	40
TRU	m ³ /yr	27	40
Mixed TRU	m ³ /yr	0	0
Number of Workers	FTEs	225	65 ^c

^a Data for 1999 are for stacks monitored at WCRRF and the Radioactive Materials Research, Operations, and Demonstration facility at TA-50. No stacks require monitoring at TA-54. All non-point sources at TA-50 and TA-54 are measured using ambient monitoring.

^b Secondary wastes are generated during the treatment, storage, and disposal of chemical and radioactive wastes. Examples include repackaging wastes from the visual inspection of TRU waste, high-efficiency particulate air filters, personnel protective clothing and equipment, and process wastes from size reduction and compaction.

^c The number of employees for 1999 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1999 operations is routinely collected information and represents only UC employees (regular part-time and full-time). Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (see Section 4.6, Socioeconomics) is not appropriate.

2.16 Non-Key Facilities

The balance, and majority, of LANL buildings are referred to in the SWEIS as the Non-Key Facilities. Non-Key Facilities house operations that do not have potential to cause significant environmental impacts. These buildings and structures are located in 30 of LANL's 49 TAs and comprise approximately 15,500 of the LANL's 27,820 acres. As discussed in Section 2.16.2 below, activities in the Non-Key Facilities encompass seven of the eight LANL direct-funded activities (DOE 1999a, page 2-2).

There are five Category 3 nuclear facilities among the Non-Key Facilities:

- Calibration Building (TA-03, Building 130)
- Physics Building (TA-03, Building 40)
- High-Pressure Tritium Facility (TA-33, Building 86)
- Nuclear Safeguards Research Building (TA-35, Building 02)
- Nuclear Safeguards Laboratory (TA-35, Building 27)

Four of these buildings hold only sealed radioactive sources. The High-Pressure Tritium Facility is in safe shutdown mode awaiting decontamination and decommissioning.

2.16.1 Construction and Modifications at the Non-Key Facilities

LANL plans for the next ten years call for the construction or modification of many buildings that are not included in the 15 Key Facilities. These changes are discussed in the following paragraphs.

a) *Atlas*: Atlas will be used for research and development in the fields of physics, chemistry, fusion, and materials science that will contribute to predictive capability for aging and performance of secondary components of nuclear weapons. The facility will require about 5 MWH of electrical energy annually (1% to 2% of total LANL consumption); will have a peak electrical demand of 12 megawatts (about 12% of total LANL demand); and will employ about 15 people. The heart of the Atlas facility is a pulsed-power capacitor bank that will deliver a large amount of electrical and magnetic energy to a centimeter-scale target in less than ten microseconds. Each experiment will require extensive preparation of the experimental assembly and diagnostic instrumentation (DOE 1996b).

Atlas is being constructed in parts of five buildings at TA-35:

- 35-124/125, Experimental Area, Control Room, and Coordination Center
- 35-126, Mechanical Services Building
- 35-294, Power Supply Building
- 35-301, Generator Building

Through 1999, \$36 million had been spent. Another \$13 million, budgeted for 2000 and 2001, will complete the facility (LANL 1999a).

b) *Industrial Research Park (IRP)*: Construction of the IRP started in 1999. A maximum of 30 acres will be developed along West Jemez Road, across from Otowi Building and the Wellness Center, and along West Road, in the vicinity of the ice rink. Up to ten buildings may be constructed, with a total floor space of 300,000 square feet and parking for 1400 cars (DOE 1997b). The IRP is a private development on DOE land leased to Los Alamos County. Because the land still belongs to DOE, land-use impacts must be considered in the Yearbook.

c) *Strategic Computing Complex (SCC)*: Construction of this new building, to house the world's fastest supercomputer, also got underway in 1999. The SCC will be a three-story structure with 267,000 square feet under roof. About 300 designers, computer scientists, code developers, and university and industrial scientists will occupy the building. The building will be connected to existing sewer, water, and natural gas lines, but will require a new 115/13.8 kV substation transformer at the TA-03 Power Plant. Six cooling towers are to be constructed, requiring an estimated 63 million gallons of cooling water per year. This water will be derived, however, from treated waters from the sewage facility, which total more than 100 million gallons annually. The SCC is projected to have a maximum electricity load requirement of seven megawatts, or about 7% of total LANL demand (DOE 1998b). Through the end of 1999, \$4 million had been spent on this \$107-million construction project (LANL 1999a).

d) *Nonproliferation and International Security Center (NISC)*: Construction of this new building also began in 1999. The NISC will be a four-story building plus basement, will have 164,000 square feet under roof, and will have a capacity to house 465 people. It is being constructed adjacent to the new SCC within the heart of TA-03. The building will have laboratories, a machine shop for fabrication of satellite parts, a high-bay fabrication area, an area for the safe handling of sealed radioactive sources, and offices. Building heating and cooling will be by closed-loop water systems. Because all occupants are to be relocated from other LANL buildings, there is no expected increase in quantities of sewage, solid wastes, or chemical wastes, nor should there be increased demand for utilities. In order to accommodate both the SCC and NISC, nearby parking lots are to be expanded to fit an additional 800 to 900 vehicles (DOE 1999e). Through the end of 1999, \$2 million had been spent on this \$63-million construction project (LANL 1999a).



Top: Conceptual drawing of NISC (left) and SCC
 Above: Industrial Research Park
 Right: Construction site

e) *Central Health Physics Calibration Laboratory*: A new Central Health Physics Calibration Laboratory was approved for line-item funding in calendar year 1999. The new facility, to be located at TA-36, will consolidate existing health physics calibration, maintenance, and repair functions into one location. Currently, these functions are undertaken in three separate structures in TA-3. Construction activities will include renovation of an existing building and a 500-square-foot addition to a second existing building. TA-36 is remote from densely populated areas of the Laboratory, is served by paved roads, and is located in a secure area. The proposal was categorically excluded from further NEPA review.

f) *NPDES Outfall Project*: During 1999, 13 outfalls from Non-Key Facilities were eliminated from the NPDES permit (Sandoval 2000). Responsibility for nine of the 13 was transferred to Los Alamos County when the County assumed ownership of water supply wells, pumping stations, storage tanks, and piping. Discharges from the remaining four outfalls were eliminated when the source activities were eliminated and were associated with water supply wells that were removed from service. Table 3.2-3 in Section 3.2, Liquid Effluents, shows the final disposition for all of the eliminated outfalls and the drainage basins to which they discharged.

Coupled with the 10 outfalls deleted during 1997 and 1998, a total of 24 of 27 outfalls from the Non-Key Facilities have now been eliminated. The only remaining outfalls for Non-Key Facilities are the following:

- 001 at TA-03-22 serves the Power Plant. The outfall, which discharges daily into a tributary of Sandia Canyon receives effluent from boiler blowdown, neutralized demineralizer regeneration brine, once-through cooling water from the sample cooling heat exchanger, blowdown from cooling towers, and floor washings from a floor drain and sink drain in the chlorine building. Also, treated effluent from the sanitary wastewater treatment plant at TA-46 is piped to the Power Plant for use in the cooling towers or to be discharged through 001.
- 13S serves the sanitary wastewater treatment plant at TA-46 but is piped to, and discharged through, outfall 001 at TA-3.
- 03A027 also discharges into a tributary of Sandia Canyon. This outfall receives treated cooling water and fire protection water from an old cooling tower (TA-3-285) that functions as a “back-up” to the cooling towers that serve refrigerant condensers for 4 to 8 chillers located at the TA-3 Laboratory Data Communications Center and Central Computing Facility. The 03A027 outfall discharges very infrequently and any discharge is usually a result of cooling tower maintenance or testing of the fire protection system. Testing of the fire protection system generally occurs up to six times per year.
- 03A160 from Building 35-124, the Antares Target Hall, discharges into Mortandad Canyon.

2.16.2 Operations at the Non-Key Facilities

Non-Key Facilities are host to seven of the eight categories of activities at LANL (DOE 1999a, pp. 2-2 through 2-9) as shown in Table 2.16.2-1 below. The eighth category, environmental restoration is discussed in Section 2.17. During 1999, no new capabilities were added to the Non-Key Facilities, and none of the above seven were deleted.

Table 2.16.2-1. Operations at the Non-Key Facilities

CAPABILITY	EXAMPLES
1. Theory, modeling, and high performance computing	Modeling of atmospheric and oceanic currents. Theoretical research in areas such as plasma and beam physics, fluid dynamics, and super-conducting materials.
2. Experimental science and engineering	Experiments in nuclear and particle physics, astrophysics, chemistry, and accelerator technology. Also includes laser and pulsed-power experiments (e.g., Atlas).
3. Advanced and nuclear materials research and development and applications	Research and development into physical and chemical behavior in a variety of environments; development of measurement and evaluation technologies.

CAPABILITY	EXAMPLES
4. Waste management	Management of municipal solid wastes. Sewage treatment. Recycle programs.
5. Infrastructure and central services	Human resources activities. Management of utilities (natural gas, water, electricity). Public interface.
6. Maintenance and refurbishment	Painting and repair of buildings. Maintenance of roads and parking lots. Erecting and demolishing support structures.
7. Management of environmental, ecological, and cultural resources	Research into, assessment of, and management of plants, animals, cultural artifacts, and environmental media (groundwater, air, surface waters).

The LANL workforce increased by 404 employees during 1999 bringing the total workforce up to 12,412 employees or 1061 more employees than were anticipated under the ROD. Approximately 27% of these new employees were either JCNNM (17%) or PTLA (10%). This reflects the new construction going on at LANL and the increased efforts in security upgrades as LANL moves forward with its assignments for Stockpile Stewardship and Management. Approximately 40% of these new employees are regular (full-time and part-time) UC employees, of which about 60% are assigned to the Key Facilities. This increase in employment at the Key Facilities during 1999 reflects the increase in Defense Program-related activities.

2.16.3 Operations Data for the Non-Key Facilities

Even though the Non-Key Facilities occupy more than half of LANL and employ about half the workforce, activities in these facilities contribute less than 10% of most operational effects. The 286 cubic meters of LLW constituted only 17% of the LANL total LLW volume. Table 2.16.3-1 presents details. Radioactive emissions from these facilities show 950 curies of tritium from off-gassing, which is slightly higher than the 910 curies projected by the ROD and about 50% of total emissions. Chemical waste also exceeds projections made by the ROD, and was driven by ER Project clean up of potential release sites (PRSs). Most chemical waste is shipped off-site for disposal and therefore will not result in environmental impacts at LANL. See Section 3.3 for a more detailed description of waste management activities at LANL.

Table 2.16.3-1. Non-Key Facilities/Operations Data

PARAMETER	UNITS	SWEIS ROD	1999
Radioactive Air Emissions: ^a			
Tritium	Ci/y	9.1E+2	9.5E+2
Plutonium	Ci/y	3.3E-6	No data ^b
Uranium	Ci/y	1.8E-4	No data ^b
NPDES Discharge	MGY	142	232
Wastes:			
Chemical	kg/yr	651,000	765,000
LLW	m ³ /yr	520	286
MLLW	m ³ /yr	30	3
TRU/Mixed TRU	m ³ /yr	0	0
Number of Workers	FTEs	6579	4601 ^c

^a Stack emissions from previously active facilities (TA-33 and TA-41); these were not projected as continuing emissions in the future. Does not include nonpoint sources.

^b Most of the stacks in the Non-Key Facilities are not sampled for radioactive airborne emissions because the potential emissions from these stacks are sufficiently small that measurement systems are not necessary to meet regulatory or facility requirements.

^c The number of employees for 1999 operations cannot be directly compared to numbers projected by the SWEIS ROD. The employee numbers projected by the ROD represent total workforce size and include PTLA, JCNNM, and other subcontractor personnel. The number of employees for 1999 operations is routinely collected information and represents only UC employees (regular full-time and part-time). Because the two sets of numbers do not represent the same entity, a direct comparison to numbers projected by the ROD (see Section 4.6, Socioeconomics) is not appropriate.

2.17 Environmental Restoration Project

The ER Project may be a major contributor to LANL's environmental effluents, and therefore, is included as a section of Chapter 2. The ROD forecast that the ER Project would contribute 60% of the chemical wastes, 35% of the LLW, and 75% of the MLLW generated at LANL over the ten years from 1996–2005. The ER Project will also affect land resources in and around LANL.

The DOE established the ER Project in 1989 to characterize and remediate sites that were known or suspected to be contaminated from historical operations. An assessment in the late 1980s resulted in the identification of over 2100 potential release sites (PRSs). Many of the sites identified remain under DOE control; however, some have been transferred into private ownership. In 1999, ER Project activities included remedial site assessments and site cleanups. Assessment resulted in the submission of eight Resource Conservation Recovery Act (RCRA) facility investigation (RFI) reports to the New Mexico Environment Department (NMED) and continuing RFI fieldwork on numerous other sites. Cleanup entailed seven sites including an inactive firing site, septic tanks, and areas with contaminated soil.

By the end of 1999, LANL was in some phase of characterization of 1206 PRSs. The ER Project had remediated 130 sites and recommended 792 sites to the regulatory authority for no further action by the end of 1999 (Bertino 2000).

2.17.1 Operations of the ER Project

To date, the total number of PRSs removed from the permit remains at 102. Of the 102 PRSs that have been removed from the permit, three were removed during the period 1989–1998 and an additional 99 were removed during 1998. During 1999, the ER Project recommended an additional 47 PRSs for no further action. These recommendations are in various stages of NMED review and public comment.

As a result of an annual audit conducted by NMED in 1999, 388 PRSs were consolidated with other PRSs for the purpose of investigation and remediation. This consolidation was also conducted to correct a faulty numbering scheme imposed on the ER Project in the early 1990s. The total number of discrete sites that are continuing to be investigated by the ER Project has been reduced to 1206.

2.17.2 Operations Data for the ER Project

Waste quantities generated during 1999 are shown in Table 2.17.2-1 below. Only chemical waste is above the quantity predicted in the SWEIS because of the disposal of extensive amounts of soil for the MDA-P project. See Section 3.3, Solid and Chemical Wastes, for a more detailed discussion of wastes generated by the ER Project.

Cleanup activities also generated solid wastes, which were disposed at the County landfill.

Table 2.17.2-1. ER Project/Operations Data

WASTE TYPE	UNITS	SWEIS ROD	1999 OPERATIONS ^a
Chemical	kgs/yr	2,000,000	14,547,936
LLW	m ³ /yr	4260	407
MLLW	m ³ /yr	548	1.25
TRU	m ³ /yr	11	0
Mixed TRU	m ³ /yr	0	0

^a Memo, J.C. Del Signore to K.H. Rea, 10/3/2000



In-situ vitrification demonstration project

3.0 Site-Wide 1999 Operations Data

The role of the Yearbook is not to present environmental impacts or environmental consequences. The Yearbook's role is to provide data that could be used to develop an impact analysis. In this chapter, the Yearbook summarizes operational data at the site-wide level. In some cases, the Yearbook does include impacts for very specific areas—worker doses and doses from radioactive air emissions. These impact assessments are routinely undertaken by LANL, using standard methodologies that duplicate those used in the SWEIS; hence, they have been included for the sake of providing the base for future trend analysis.

This chapter of the Yearbook compares actual operating data to projected effects for about half of the parameters discussed in the SWEIS. These include effluent, workforce, regional, and long-term environmental effects. Some of the parameters used for comparison had to be derived from information contained in both the main text and appendices of the SWEIS. Many parameters cannot be compared because data are not routinely collected. In these cases, projections made in the SWEIS resulted only from the expenditure of considerable special effort, and such extra costs were avoided when preparing the Yearbook.

3.1 Air Emissions

3.1.1 Radioactive Air Emissions

Radioactive airborne emissions from point sources (i.e., stacks) during 1999 totaled approximately 1900 curies, less than 10% of the ten-year average of 21,700 curies projected by the ROD.⁴ These low emissions result from operations at the Key Facilities not being performed at projected levels. LANL is still gearing up to initiate its new assignments. In addition, a major source of these emissions (the Area A beam stop at LANSCE) was not used.

The two largest contributors to radioactive air emissions were tritium from the Tritium Facilities (both Key and Non-Key) and activation products from LANSCE. Stack emissions from the Tritium Key Facilities were about 650 curies, and tritium emissions from the Non-Key Facilities were 950 curies. This 950 curies represents off gassing from operations no longer in use at TA-33 (High Pressure Tritium Facility) and TA-41 (Tritium Laboratory). LANSCE emissions totaled 300 curies and accounted for about 15% of the LANL total, but were only about 2% of the projected ten-year average of about 16,800 curies for LANSCE.

Non-point sources of radioactive air emissions are present at LANSCE, Area G, TA-18, and other locations around the Laboratory. Non-point emissions, however, are small compared to stack emissions. For example, non-point air emissions from LANSCE were less than 20 curies. Additional detail about radioactive air emissions is provided in the Laboratory's annual compliance report to the Environmental Protection Agency (EPA; Jacobson 2000) and in Chapter 4 of the 1999 Environmental Surveillance Report (LANL 2000b).

The calculated dose to the MEI by the air pathway for 1999 was 0.32 millirem, including contributions from stack emissions and non-point sources such as Area G and the firing sites.

The calculated MEI dose attributable to LANSCE was less than 0.1 millirem. These values are less than one-tenth of the 5.44 millirem projected by the ROD and are well below the EPA emission standard of 10 mrem/yr.

3.1.2 Non-Radioactive Air Emissions

3.1.2.1 Emissions of Criteria Pollutants

Criteria pollutant emissions (oxides of nitrogen, sulfur oxides, carbon monoxide, and particulate matter) from fuel burning equipment are reported in the "Emissions Inventory Report Summary, Reporting Requirements for the New Mexico Administrative Code, Title 20, Chapter 2, Part 73 (20 NMAC 2.73) for Calendar Year 1999" (LANL 2000a). The report provides emission estimates for the Laboratory's steam plants, nonexempt boilers, asphalt plant, and the water pump. In addition, emissions from the paper shredder, rock crusher, degreaser, and beryllium machining operations are reported. Information on total volatile organic compounds released from painting and research and development operations is presented.

⁴ These values represent a summation of the data presented in the data tables, Chapter 3, of the SWEIS.

LANL, in comparison to industrial sources and power plants, is a relatively small source of non-radioactive air pollutants. As such, the Laboratory is required to estimate emissions, rather than perform actual stack sampling. Calculated emissions for criteria pollutants during 1999 were less than amounts assumed for the ROD as shown in Table 3.1.2.1-1 below.

Table 3.1.2.1-1 Emissions of Criteria Pollutants

POLLUTANTS	UNITS	SWEIS ROD	1999
Carbon monoxide	Tons/year	58	32
Nitrogen oxides	Tons/year	201	88
Particulate matter	Tons/year	11	4.5
Sulfur oxides	Tons/year	0.98	0.55

Since the analysis of ROD emissions of criteria pollutants indicated no adverse air quality impacts, this same conclusion can be drawn for 1999 emissions.

3.1.2.2 Chemical Usage and Emissions

The SWEIS contained projections for toxic air pollutants, based on chemical use at each TA, rather than at each Key Facility; these projections were then compared to a screening level. Emissions from only one Key Facility, High Explosive Testing, exceeded the screening level of the analysis. Therefore, chemical use (the relevant parameter) was only included in the table of parameters for this Key Facility. However, usage of non-radioactive materials in firing site operations was also well below the amounts projected. Therefore, estimated air concentrations for 1999 were less than projected by the ROD.

This edition of the Yearbook is proposing to report chemical usage and calculated emissions for the Key Facilities, based on an improved chemical reporting system. The 1999 estimates of chemical usage were obtained from the Laboratory's Automated Chemical Inventory.

System (ACIS). The quantities used for this report represent all chemicals procured or brought on site in 1999. This methodology is the same as that used by the Laboratory for reporting under the Superfund Amendments and Reauthorization Act, specifically Section 313 of the Emergency Planning Community Right-to-Know Act.

An overview of the 1995 data used for the SWEIS compared to the 1999 data shows some substantial differences. The 1999 data are believed to be more accurate and up-to-date for two reasons. First, in 1998 the Laboratory instituted a chemical management standard. The standard requires that all chemicals appear on ACIS. Secondly, in 1998-1999, a wall-to-wall inventory of the Laboratory was conducted to update ACIS.

Air emissions shown in Tables A-2 through A-16 of the Appendix are divided into emissions by Key Facility. Emission estimates (expressed as kilograms per year) were performed in the same manner as that reported in the ROD. First, the usage of the listed chemicals was summed by facility. It was then estimated that 35% of the chemical used was released to the atmosphere. However, emission estimates for mercury and solid metals were assumed to vent at levels below 1% of the total used. It was presumed that metal emissions would come from cutting, and possibly, melting operations. Fuels such as propane were assumed to be combusted.

As expected, a number of chemicals evaluated in the ROD were not used in 1999 and vice versa. Table A-1 (Appendix) lists, by TA, the number of chemicals used in 1995 but not used in 1999 and the number of chemicals used in 1999 but not used in 1995.

The chemical comparison above indicates that the number of chemicals used in 1999 at each of the Key Facilities was substantially less than that evaluated in the ROD. These changes are believed to be a result of more accurate chemical data collection. Information related to actual chemical use and estimated emissions for each Key Facility is shown in the Appendix.

Overall chemical use and emissions resulting from that use have decreased from that reported in the 1995 ROD. Additional information related to emissions reporting can be found in the “Emissions Inventory Report Summary, Reporting Requirements for the New Mexico Administrative Code, Title 20, Chapter 2, Part 73 (20 NMAC 2.73) for Calendar Year 1999” (LANL 2000a).

3.2 Liquid Effluents

Based on average daily flows as reported by the Laboratory’s Water Quality and Hydrology Group and on operational records when available, effluent flow through NPDES outfalls totaled an estimated 317.2 million gallons in 1999, compared to 278 million gallons projected by the ROD.⁵ Key Facilities accounted for approximately 84.5 million gallons of that total. This flow can be examined by watershed (Figure 3-1) in Table 3.2-1 and by facility in Table 3.2-2 to understand differences from projections.

Table 3.2-1. NPDES Discharges by Watershed

WATERSHED	# OUTFALLS (SWEIS ROD)	# OUTFALLS ^a (1999)	DISCHARGE ^b (SWEIS ROD)	DISCHARGE ^{a,b} (1999)
Cañada del Buey	3	3 ^c	6.4	2.6
Guaje	7	6 ^d	0.7	1.7
Los Alamos	8	7	44.8	45.2
Mortandad	7	6	37.4	39.3
Pajarito	11	2 ^e	2.6	0
Pueblo	1	1	1.0	0.9
Sandia	8	6	170.7	213.2 ^c
Water	10	5 ^f	14.2	14.3
Totals	55	36	278.0	317.2

^a Includes outfalls that were eliminated during 1999, some of which had flow. Twenty outfalls discharged during 1999.

^b Millions of gallons per year.

^c Includes effluent from SWS, which is piped to TA-3 and ultimately discharges to Sandia Canyon via outfall 001.

^d Includes 04A176 discharge to Rendija Canyon, a tributary to Guaje Canyon.

^e Includes 06A106 discharge to Three-Mile Canyon, a tributary to Pajarito Canyon. See Table 3.2-3.

^f Includes 05A055 discharge to Valle Canyon, a tributary to Water Canyon.

The number of outfalls listed in the NPDES permit had decreased by 16, to 20, at the end of 1999, see Table 3.2-3. Three of the 16 outfalls eliminated during 1999, 03A040, 03A045, and 06A106, were associated with the HRL, Radiochemistry Laboratory, and High Explosives Testing Key Facilities, respectively; and, each was eliminated after cessation of source activities and processes or redirecting flows to other outfalls, primarily to the sanitary system. Most of the reductions (9 of the 16) during 1999 were the result of transferring the water supply system from the DOE to Los Alamos County. Those outfalls were removed from the Laboratory’s NPDES permit and added to the Los Alamos County NPDES permit application. Four other water supply wells were taken out of production, their pumping equipment removed, and their outfalls eliminated. Table 3.2-3 also shows the final disposition for each of the eliminated outfalls and the drainage basins to which they discharged.

Table 3.2-2 compares NPDES discharges by facility. The Non-Key Facilities had the largest differences between 1999 discharges and discharges projected by the ROD. For the Non-Key Facilities, discharges from the outfall at the TA-3 power plant were appreciably higher, 165 million gallons discharged in 1999 compared to a projected discharge of 114 million gallons. Approximately 106 million gallons of the discharge from outfall 001 at the power plant are attributable to sanitary effluent piped from TA-46 to TA-3 to be used as makeup water. The combined flows of the sanitary waste treatment plant and the TA-3 Steam Plant account for about half of the total

⁵ For some facilities, flows are determined by recorders installed at the end of the pipe. This was the case for outfalls at the SWS, HEWTF, RLWTF, and the Power Plant. For all other outfalls, annual totals were calculated from discharge monitoring reports (DMRs) provided by the Laboratory’s Water Quality and Hydrology Group. This latter method substantially overestimates the quantity of wastewater discharged because it is based on infrequent sampling and the DMRs assume round-the-clock flow for all outfalls.

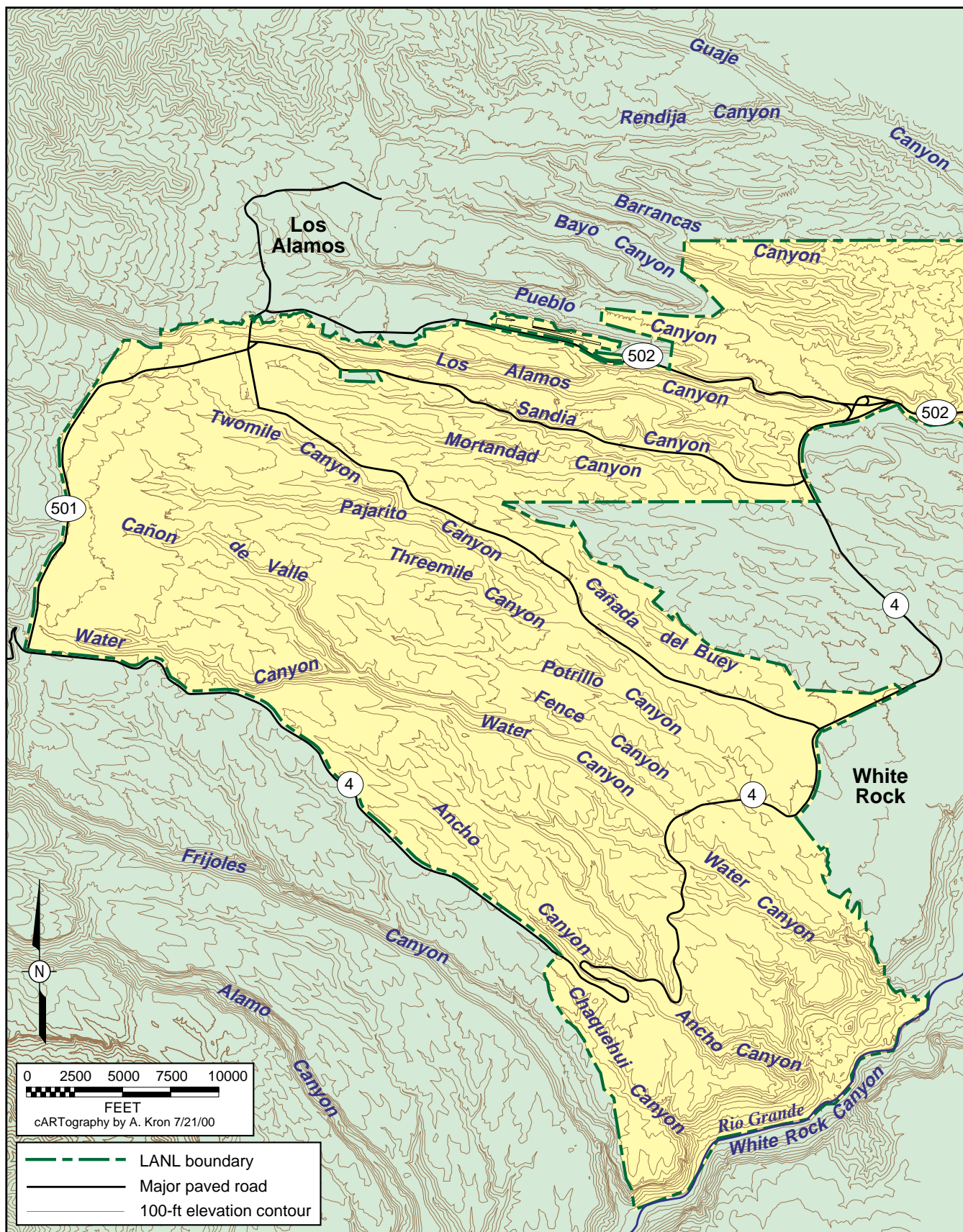


Figure 3-1 Location of Watershed Canyons

discharge from Non-Key Facilities and one-third of the water discharged by the Laboratory. Additionally, flows from two outfalls removed from the permit during 1999 had previously been redirected to the sanitary system, see Table 3.2-3. –For Key Facilities, LANSCE discharged approximately 37.2 million gallons for 1999, accounting for nearly half of the total discharges from all Key Facilities, see Table 3.2-2.

Treated waters released from LANL outfalls rarely leave the site. An indicator of this is provided by stream gage measurements near downstream site boundaries in seven watersheds as reported in “Surface Water Data at Los Alamos National Laboratory; 1999 Water Year” (Shaull et al. 2000).



Typical NPDES-regulated outfall

Table 3.2-2. NPDES Discharges by Facility

FACILITY ^a	# OUTFALLS (SWEIS ROD)	# OUTFALLS ^b (1999)	DISCHARGE ^c (SWEIS ROD)	DISCHARGE ^{b,c} (1999)
Plutonium Complex	1	1	14.0	8.6
Tritium Facility	2	2	0.3	9
CMR Building	1	1	0.5	4.5
Sigma Complex	2	2	7.3	5.9
High Explosives Processing	11	3	12.4	0.2
High Explosives Testing	7	3	3.6	14.3
LANSCE	5	4	81.8	37.2
HRL	1	1	2.5	0
Radiochemistry Facility	2	1	4.1	0
RLWTF	1	1	9.3	5.3
Pajarito Site		0	0	0
MSL		0	0	0
TFF		0	0	0
Machine Shops		0	0	0
Waste Management Operations		0	0	0
Non-Key Facilities	22	17	142.1	232
Totals	55	36	278.0	317.2

^a No outfalls for Pajarito Site, MSL, TFF, Shops, and the Solid Radioactive and Chemical Waste Facility.

^b Includes 16 outfalls that were eliminated during 1999, some of which had flow for part of the year.

^c Millions of gallons per year.

LANL has three principal wastewater treatment facilities—the sewage plant (SWS) at TA-46, the RLWTF at TA-50, and the HEWTF at TA-16. The sewage treatment plant at TA-46 processed 106 million gallons of treated wastewater and sewage during 1999. From TA-46, treated liquid effluent is pumped to the TA-3 power plant where it is either used to provide make up water for the cooling towers or is discharged directly into Sandia Canyon via outfall 001. For 1999 the reported total discharge from the power plant into Sandia Canyon was approximately 166 million gallons based on averaged daily flows

The RLWTF, Building 50-01, outfall 051 discharges into Mortandad Canyon. Process modifications projected by the ROD were installed during 1997 and 1998, but did not become operational until March of 1999. These

modifications are designed to achieve compliance with more stringent NMED effluent limits for nitrates, fluoride, other NPDES permit limits, and DOE Derived Concentration Guidelines for radioactive constituents released to the environment. During 1999, 5.3 million gallons of treated radioactive liquid waters were released to Mortandad Canyon, compared to 9.3 million gallons projected by the ROD.

The TA-16 HEWTF, discharged a total of 0.096 million gallons compared to 0.13 projected in the ROD. Effluent quality was similar to that of recent years. Details on all non-compliance situations are provided in the 1999 Annual Environmental Surveillance Report (LANL 2000b).

Table 3.2-3. NPDES Outfalls Deleted in 1999

OUTFALL	LOCATION	DRAINAGE	DATE	FINAL DISPOSITION
03A-040	TA-43-1	Los Alamos	1/11/99	Seven sub-basement floor drains discharging cooling water blowdown were re-routed to the sanitary waste line on 3/6/97. Thirteen roof drains and two sub-basement floor drains continue to discharge storm water through the existing outfall piping.
03A-045	TA-48-1	Mortandad	12/6/99	Cooling water blowdown discharging to a basement floor sink drain was re-routed to the sanitary waste line on 12/10/96. Twenty-six roof drains continue to discharge storm water through the existing outfall piping.
04A-118 04A-161 04A-163 04A-164 04A-165 04A-166 04A-172 04A-177 04A-186	Pajarito #4 Otowí #1 Pajarito #1 Pajarito #2 Pajarito #3 Pajarito #5 Guaje #1A Guaje Booster Otowí #4	Cañada del Buey Pueblo Sandia Pajarito Sandia Cañada del Buey Guaje Guaje Los Alamos	10/13/99	The nine water wells and associated NPDES-Permitted outfalls are part of the Los Alamos Municipal Water Supply System. The U.S. DOE leased the water supply system on 9/8/98 to the Los Alamos County. The nine outfalls associated with these water supply wells were deleted from the Laboratory's NPDES permit following the submittal of an NPDES Application by the County.
04A-171 04A-175 04A-176	Guaje #1 Guaje #5 Guaje #6	Guaje Guaje Guaje	8/23/99	These three water supply wells and outfalls are no longer operational. Pumping equipment has been removed and well house structures have been demolished.
04A-173	Guaje #2	Guaje	9/21/99	The water supply well and associated outfall are no longer in operation. Pumping equipment has been removed and the well house structure has been demolished.
06A-106	TA-36-1 ^a	Three Mile	1/11/99	All drains in Rooms 7 and 8 associated with the photo-processing lab were plugged and the process equipment has been removed.

^a Key Facility, Three-Mile Canyon is a tributary to Pajarito Canyon.

3.3 Solid Radioactive and Chemical Wastes

LANL generates radioactive and chemical wastes as a result of research, operations, maintenance, construction, and environmental restoration activities. These wastes are categorized as one of five types. The management of each type has different regulatory requirements. Waste generators can be assigned to one of three categories—Key Facilities, Non-Key Facilities, and the ER Project.

Comparisons of 1999 waste quantities to projections made by the ROD are made in the following paragraphs on the basis of waste type, generator category, or both. No distinction has been made between routine wastes (such as those generated from ongoing operations) and non-routine wastes (such as those generated from the decontamination and decommissioning of buildings). A summary of this comparison appears in Table 3.3-1 below.

Table 3.3-1. LANL Waste Types and Generation

WASTE TYPE	UNITS	SWEIS ROD	1999	% OF ROD	REASONS FOR 1999 DIFFERENCES
Chemical	10 ³ kg/yr	3250	15,443	475	ER Project
LLW	m ³ /yr	12,200	1710	14	ER Project, High Explosives
MLLW	m ³ /yr	632	21	3	ER Project
TRU/Mixed TRU	m ³ /yr	448	215	48	Pits
TRU	m ³ /yr	333	143	43	Pits
Mixed TRU	m ³ /yr	115	72	63	Pits

Projections in the ROD and actual quantities generated in 1999 differed significantly for three of the five waste types. The ER Project played a significant role in differences for all three types. Large quantities of chemical waste, primarily contaminated soil, were generated by the ER Project from remediation of MDA-P. On the other end of the spectrum, MLLW generation was significantly lower than projected in the ROD because the ER Project generated only one cubic meter (versus 548 projected). Finally, LLW generation continued to be significantly lower than projections because CMR, Sigma, and the High Explosives Facilities (Shops, Processing, and Testing) had lower-than-projected levels of activity. Combined, these five facilities generated just 325 cubic meters of LLW versus 4342 cubic meters projected by the ROD.

3.3.1 Chemical Wastes

Chemical waste generation in 1999 exceeded waste volumes projected by the ROD by a factor of five. These large quantities of chemical waste will not result in as significant an on-site environmental impact as the waste volume suggests because most chemical waste is shipped to commercial disposal facilities. Examination of the generator categories (Table 3.3.1-1) sheds some light on where these large quantities are generated.

Table 3.3.1-1. Chemical Waste Generators and Quantities

WASTE GENERATOR	UNITS	SWEIS ROD	1999
Key Facilities	10 ³ kg/yr	600	129
Non-Key Facilities	10 ³ kg/yr	650	765
ER Project	10 ³ kg/yr	2000	14,548
LANL	10 ³ kg/yr	3250	15,443

As can be seen in Table 3.3.1-1, cleanup efforts of the ER Project accounted for the large waste volumes, almost 95% of the total. While the ER Project generated wastes from investigation and remediation of several sites, most of the 14.5 million kilograms of chemical waste generated by the ER Project resulted from remediation of PRSs at TA-16, particularly MDA-P. MDA-P is being exhumed as part of a clean-closure under the RCRA. The bulk of the material removed from MDA-P was soil overburden and soil beneath the scrap metal and other wastes

that had been disposed in the site. Soil, scrap metal, containers, and miscellaneous equipment and debris that were characterized as hazardous waste were shipped off-site for treatment and disposal since LANL has no on-site capacity for disposal of hazardous waste. Some nonhazardous wastes, soil, concrete rubble, and debris were disposed in MDA-J at TA-54, a solid waste landfill undergoing closure. Approximately 4.7 million kilograms of soil and concrete rubble from MDA-P were placed in MDA-J as fill in preparation for capping (1999 Annual Report Questionnaire for the Los Alamos National Laboratory, Technical Area 54, Area J Landfill). Substantial quantities of scrap metal exhumed from MDA-P were decontaminated on-site at TA-16 and subsequently shipped off-site to scrap metal recyclers.

Overall, the Laboratory generated approximately 4.5 million kilograms of hazardous and mixed wastes during 1999 (LANL 2000c). Again, nearly 3.9 million kilograms were generated by the ER Project while investigating and remediating solid waste management units. The ER Project is discussed in more detail in Section 2.17. The remainder of the chemical waste was generated by a variety of organizations and activities associated with research, decommissioning and decontamination, and facilities maintenance.

Four of the Key Facilities also had substantial departures from projections. The Machine Shops generated less than 1% of the projected waste quantity for the Expanded Alternative (474,000 kilograms projected compared to 3955 actual). The lower than expected waste generation at the Shops resulted from a combination of waste minimization efforts and a much lower workload than projected in the SWEIS. Additionally, the workload at the Shops is directly linked with high explosives testing and processing operations. Chemical waste volumes also differed from projections for the High Explosives Testing Facility (35,300 kilograms projected compared to 1015 actual). Finally, the High Explosives Processing Key Facility generated larger quantities of chemical wastes (13,000 kilograms projected compared to 95,184 actual). However, approximately 81,855 kilograms were generated from the updating or closure of filter beds and open burning sites (TA-16-401, -406, -388, -399, -394) used to treat waste high explosives.

3.3.2 Low-Level Radioactive Wastes

LLW generation in 1999 was less than 15% of waste volumes projected by the ROD. As can be seen in Table 3.3.2-1, cleanup efforts of the ER Project generated only about 10% of projected LLW volumes. Key Facilities account for most of the departure from projections, however. Large differences occurred at the CMR Building (1820 cubic meters projected compared to 189 actual), LANSCE (1085 cubic meters projected compared to 70 actual), the Sigma Complex (960 cubic meters projected compared to 61 actual), the Machine Shops (606 cubic meters projected compared to 40 actual), and High Explosive Testing (940 cubic meters projected compared to zero actual). LANSCE generated lower volumes than projected because decommissioning and renovation of Experimental Area A did not occur. Low workloads accounted for low waste volumes at the other four Key Facilities.

Table 3.3.2-1. LLW Generators and Quantities

WASTE GENERATOR	UNITS	SWEIS ROD	1999
Key Facilities	m ³ /yr	7450	1017
Non-Key Facilities	m ³ /yr	520	286
ER Project	m ³ /yr	4260	407
LANL	m ³ /yr	12,230	1710

3.3.3 Mixed Low-Level Radioactive Wastes

Generation in 1999 was less than 5% of MLLW volumes projected by the ROD. Table 3.3.3-1 examines these wastes by generator categories.

Table 3.3.3-1. MLLW Generators and Quantities

WASTE GENERATOR	UNITS	SWEIS ROD	1999
Key Facilities	m ³ /yr	54	17
Non-Key Facilities	m ³ /yr	30	3
ER Project	m ³ /yr	548	1
LANL	m ³ /yr	632	21

As can be seen in the table, small waste quantities from the ER Project account for nearly all the difference between SWEIS projections and 1999 actual generation of MLLW.

3.3.4 Transuranic/Mixed Transuranic Wastes

Generation of TRU/mixed TRU waste in 1999 was less than half of volumes projected by the ROD. As projected, TRU wastes are expected to be generated in five facilities (the Plutonium Facility Complex, the CMR Building, the High Explosive Testing Facilities, the RLWTF, and the Solid Radioactive and Chemical Waste Facility) and by the ER Project. Mixed TRU wastes are only expected from two facilities (the Plutonium Facility Complex and the CMR Building). Table 3.3.4-1 examines these wastes by generator categories.

Table 3.3.4-1. 1999 Transuranic/Mixed Transuranic Waste Generators and Quantities

CATEGORY	UNITS	KEY FACILITIES	NON-KEY FACILITIES	ER PROJECT	LANL
SWEIS ROD (TRU/Mixed TRU)	m ³ /yr	437	0	11	448
SWEIS ROD (TRU)	m ³ /yr	322	0	11	333
SWEIS ROD (Mixed TRU)	m ³ /yr	115	0	0	115
1999 TRU/Mixed TRU	m ³ /yr	215	0	0	215
1999 TRU	m ³ /yr	143	0	0	143
1999 Mixed TRU	m ³ /yr	72	0	0	72

The departure from projections in 1999 is almost entirely accounted for in two Key Facilities—the Plutonium Complex and the RLWTF. The Plutonium Complex was projected at 339 cubic meters and only produced 160 cubic meters of TRU/mixed TRU waste. The RLWTF was projected at 30 cubic meters and only produced 4.6 cubic meters. These differences exist because manufacture of war reserve pits had not begun at the Plutonium Complex and configuration of the new membrane treatment process at the RLWTF was slightly different than originally designed.

Personnel loading a Transuranic Packaging Transporter Model 2 (TRUPACT II) for shipping waste to the pilot plant



3.4 Utilities

Ownership and distribution of utility services continues to be split between DOE and Los Alamos County. DOE owns and distributes most utility services to LANL facilities, and the County provides these services to the communities of White Rock and Los Alamos. Routine data collection for both gas and electricity are done on a fiscal year basis, and keeping with the goal of using routinely collected data, this information is presented by fiscal year in the Yearbook. Water data, however, are routinely collected and summarized by calendar year.

3.4.1 Gas

There was a change in ownership to the DOE Natural Gas Transmission Line in August 1999. DOE sold 130 miles of gas pipeline and metering stations to the Public Service Company of New Mexico (PNM). This gas pipeline transverses the area from the Kutz Canyon Processing Plant south of Bloomfield, New Mexico, to Los Alamos. Approximately 4 miles of the gas pipeline are within LANL. Table 3.4.1-1 presents gas usage by LANL for fiscal year 1999. Approximately 90% of the gas used by LANL continued to be used for heating (both steam and hot air). The remainder was used for electrical production. The electrical generation was used to fill the difference between peak loads and the electric contractual import rights.

As shown in Table 3.4.1-1, total gas consumption for fiscal year 1999 was less than the projected use in the ROD. During fiscal year 1999, less natural gas was used for heating because of the warmer than normal weather pattern, but more natural gas was used for electric generation at the TA-03 Power Plant. In addition, as shown in Table 3.4.1-2, the TA-16 steam production plant was shut down in 1997 when the new heating systems for TA-16 became fully operational.

Table 3.4.1-1. Gas Consumption (decatherms^a) at LANL/Fiscal Year 1999

SWEIS ROD	TOTAL LANL CONSUMPTION	TOTAL USED FOR ELECTRIC PRODUCTION	TOTAL USED FOR HEAT PRODUCTION	TOTAL STEAM PRODUCTION
1,840,000	1,428,568	241,490	1,187,078	Table 3.4.1-2

^a A decatherm is equivalent to 1000-1100 cubic feet of natural gas.

Table 3.4.1-2. Steam Production at LANL/Fiscal Year 1999

TA-3 STEAM PRODUCTION (klb ^a)	TA-16 STEAM PRODUCTION (klb)	TA-21 STEAM PRODUCTION (klb)	TOTAL STEAM PRODUCTION (klb)
576,548 ^b	Eliminated Feb 1997 ^c	29,468	606,016

^a klb: Thousands of pounds

^b TA-3 steam production has two components: that used for electric production (262,100 klb in 1999) and that used for heat (312,448 klb in 1999).

^c Steam production at the TA-16 central steam plant ceased in February 1997 when new heating systems became operational.

3.4.2 Electricity

LANL is supplied with electrical power through a cooperative arrangement with Los Alamos County, known as the Los Alamos Power Pool (LAPP), which was established in 1985. The DOE Albuquerque Operations Office and Los Alamos County have entered into a 10-year contract known as the Electric Coordination Agreement whereby each entity's electric resources are consolidated or pooled. The capacity rating of LAPP resources, less losses, is 110 megawatts and 88 megawatts (summer and winter seasons, respectively). The transmission import capacity is contractually limited to 95 megawatts and 73 megawatts (summer and winter seasons, respectively).

The ability to accept additional power into the LAPP grid is limited by the regional electric import capability of the existing northern New Mexico power transmission system. In recent years, the population growth in

northern New Mexico, together with expanded industrial and commercial usage, has greatly increased the power demands on the northern New Mexico regional power system. Several proposals for bringing additional power into the region have been considered. Power line corridor locations remain under consideration, but it is uncertain when any new regional power lines would be constructed and become serviceable. An additional limitation to additional power is the contractual rights held by the LAPP for importing power from the regional transmission network.

Table 3.4.2-1 shows peak demand and Table 3.4.2-2 shows annual use of electricity for fiscal year 1999. LANL's electrical energy use remains below projections in the ROD. The ROD projected peak demand to be 113,000 kilowatts with 63,000 kilowatts being used by LANSCE and about 50,000 kilowatts being used by the rest of the Laboratory. In addition, the ROD projected annual use to be 782,000 megawatts with 437,000 megawatts being used by LANSCE and about 345,000 megawatts being used by the rest of the Laboratory. Actual use has fallen below these values, and the projected periods of brownouts have not occurred. However, on a regional basis, failures in the PNM system have caused blackouts in northern New Mexico and elsewhere.

Table 3.4.2-1. Electric Peak Coincident Demand/Fiscal Year 1999

CATEGORY	LANL BASE	LANSCE	LANL TOTAL	COUNTY TOTAL	POOL TOTAL
SWEIS ROD	50,000 ^a	63,000	113,000	Not projected	Not projected
FY1999	43,976	24,510	68,486	14,399	82,885

^a All figures in kilowatts.

Table 3.4.2-2. Electric Consumption/Fiscal Year 1999

CATEGORY	LANL BASE	LANSCE	LANL TOTAL	COUNTY	POOL TOTAL
SWEIS ROD	345,000 ^a	437,000	782,000	Not projected	Not projected
FY1999	255,562	113,759	369,321	106,547	475,868

^a All figures in megawatt-hours.

3.4.3 Water

Before September 8, 1998, DOE supplied all potable water for LANL, Bandelier National Monument, and Los Alamos County, including the towns of Los Alamos and White Rock. This water was obtained from DOE's groundwater right to withdraw 5541.3 acre-feet/year or about 1806 million gallons of water per year from the main aquifer. On September 8, 1998, DOE leased these water rights to Los Alamos County. This lease also included DOE's contracted annual right obtained in 1976 to 1200 acre-feet/year of San Juan-Chama Transmountain Diversion Project water. The lease agreement is effective for three years, although the County can exercise an option to buy sooner than three years. DOE expects to convey 70% of the water rights to Los Alamos County and lease the remaining 30% to them. The San Juan-Chama rights will be transferred in their entirety to the County. The agreement between DOE and the County does not preclude provision of additional waters in excess of the 30% agreement, if available. However, the agreement also states that should the County be unable to provide water to its customers, the County shall be entitled to reduce water services to DOE in an amount equal to the water deficit.

The DOE and LANL recognize the need to adhere to the provisions of the lease agreement. However, it is important to make a distinction between water rights and water use. For example, in 1997, LANL used 38% of the total water used, and Los Alamos County used the remaining 62%, for the 100% total. However, this water use did not use 100% of the water rights. LANL used only 27% of the water rights, while Los Alamos County used 44% of the water rights, leaving 29% of the water rights unused. That unused portion of water rights is available for sale, according to the agreement. The future development of the County could, however, increase the County's water use. Thus, the Laboratory is neither guaranteed 1662 acre-feet/year (542 million gallons/year) nor necessarily limited to 1662 acre-feet/year.

In addition, it is also important to understand how the Laboratory water use has been determined. Up to the transfer of the water production system to the County, the Laboratory was responsible for water production. Water usage by the County was metered. The Laboratory water usage was estimated by subtracting the county usage from the known well production. Until the transfer, users such as Bandelier National Monument and others were included in the Laboratory total, as were losses in the supply system, such as would occur from the purging of wells.

Metering of LANL's actual water usage began in October 1998 after Los Alamos County took over the water production system on September 8, 1998. Meters are planned to be added at selected facilities/equipment and trunk lines to begin to determine specific use at LANL.

Table 3.4.3-1 shows water consumption in thousands of gallons for calendar year 1999. Under the expanded alternative, water use for LANL was projected to be 759 million gallons per year with 265 million gallons being used by LANSCE and 494 million gallons being used by the rest of the Laboratory. Actual use by LANL in 1999 was about 300 million gallons less than the projected consumption and 89 million gallons less than the 542 million gallons/year under the agreement with the County. The calculated NPDES discharge of 317 million gallons was about 70% of the total LANL usage of 453 million gallons.

Table 3.4.3-1. Water Consumption (thousands of gallons) for Calendar Year 1999

CATEGORY	LANL	LOS ALAMOS COUNTY	TOTAL
SWEIS ROD	759,000	Not Available ^a	Not Available ^a
Calendar Year 1999	453,094	Not Available ^a	Not Available ^a

^a On September 8, 1998, Los Alamos County acquired the water supply system and LANL no longer collects this information.

As a result of the lease, LANL no longer maintains records for total water consumption or usage by Los Alamos County. The County now bills LANL for water, and all future water use records maintained by LANL will be based on those billings. Along with this transfer, Los Alamos County accepted responsibility for all chlorinating stations, and the County now operates these stations. The distribution system remaining under LANL control, and being used to supply water to LANL facilities, now consists of a series of reservoir storage tanks, pipelines, and fire pumps. The LANL system is gravity fed with fire pumps for high-demand situations.



Deep well drilling rig

3.5 Worker Safety

Working conditions at LANL have remained essentially the same as those identified in the SWEIS. DARHT and Atlas—major construction activities—were reflected in the SWEIS analysis. Few other major construction projects have been undertaken, and more than half the workforce remains routinely engaged in activities that are typical of office and computing industries. Much of the remainder of the workforce is engaged in light industrial and bench-scale research activities. Approximately one-tenth of the general workforce at LANL continues to be engaged in production, services, maintenance, and research and development within Nuclear and Moderate Hazard facilities.

3.5.1 Accidents and Injuries

Occupational injury and illness rates for workers at LANL declined during calendar year 1999 as shown in Table 3.5.1-1. These rates correlate to 258 reportable injuries and illnesses during the year, compared to 507 projected by the ROD.

Table 3.5.1-1. Total Recordable and Lost Workday Case Rates at LANL

CALENDAR YEAR	UC WORKERS ONLY		LANL (ALL WORKERS)	
	TRI ^a	LWC ^b	TRI	LWC
1999	2.37	1.24	2.52	1.37

^a TRI: Total Recordable Incident rate, number per 200,000 hours worked

^b LWC: Lost Workday Cases, number of cases per 200,000 hours worked

3.5.2 Ionizing Radiation and Worker Exposures

Occupational radiation exposures for workers at LANL during calendar year 1999 are summarized in Table 3.5.2-1. The collective Total Effective Dose Equivalent, or collective TEDE, for the LANL workforce during 1999 was 131 person-rem, considerably lower than the workforce dose of 704 person-rem projected for the ROD.

Table 3.5.2-1. Radiological Exposure to LANL Workers

PARAMETER	UNITS	SWEIS ROD	VALUE FOR 1999
Collective TEDE (external + internal)	person-rem	704	131
Number of workers with non-zero dose	number	3548	1427
Average non-zero dose: external + internal	millirem	Not projected	92
external only	millirem	Not projected	90

These reported doses for 1999 could change with time. Estimates of committed effective dose equivalent in many cases are based on several years of bioassay results, and as new results are obtained the dose estimates may be modified accordingly.

Of the 131 person-rem collective TEDE reported for 1999, external radiation and tritium exposure accounted for 128 person-rem. The remainder is from internal exposure. It is not possible to identify a single reason for the decrease in collective TEDE in 1999 from the 208 person-rem of 1993–1995. Rather, the decrease is an aggregation of several reasons, the more important of which include the following:

Work and Workload: Changes in workload and types of work have resulted in a decreased collective TEDE. The SWEIS used the 1993–1995 time frame as its base. For example, at that time the radionuclide power source for the Cassini spacecraft was being constructed at TA-55. This project incurred higher neutron exposure for the workers. After the project was completed in the 1995–1996 time frame, the LANL collective TEDE was reduced.

As Low As Reasonably Achievable (ALARA) Program: Improvements from the ALARA program, such as the continuing addition of shielding at LANL workplaces, have also resulted in lower worker exposures and consequently a reduced collective TEDE for the Laboratory.

Improved personnel dosimeter: An improved personnel dosimeter was introduced on a Laboratory-wide basis in April 1998. The dosimeter's increased accuracy in measuring the external neutron dose removed some conservatism that had been previously used in estimating the dose, which resulted in lower reported doses. (The actual dose did not change, but the ability to measure it accurately improved.)

Internal dose: Finally, the TEDE in 1999 was also lower because the 1999 internal collective effective dose equivalent was lower than that of 1993–1995.

In addition to being less than the TEDE levels in 1993–1995, the TEDE for 1999 is also less than the TEDE projected in the ROD. Because the ROD was not signed until September 1999, the implementation of war reserve pit manufacture was not fully operational at LANL. This also contributed to lower doses than projected in the SWEIS.

Collective TEDEs for Key Facilities In general, TEDEs by Key Facility or TA are difficult to determine because these data are collected at the Group level, and members of many groups and/or organizations receive doses at several locations. The fraction of a group's collective TEDE coming from a specific Key Facility or TA can only be estimated. For example, personnel from the Health Physics Operations Group and JCNNM are distributed over the entire Laboratory, and these two organizations account for a significant fraction of the total LANL collective TEDE. Nevertheless, because the groups working at TA-55 and TA-18 are relatively well defined, an estimate was made of the 1999 collective TEDE for the Plutonium Complex (93 person-rem) and the Pajarito Site (1.8 person-rem) Key Facilities. The estimate for TA-55 demonstrates that approximately two-thirds of the total Laboratory TEDE is a result of operations at the Plutonium Complex.

3.6 Socioeconomics

The LANL-affiliated workforce continues to include UC employees and subcontractors. As shown in Table 3.6-1, there has been a steady growth in number of employees. The 12,412 employees at the end of calendar year 1999 represent 1061 more employees than were anticipated under the ROD, which projected a workforce of 11,351 based on the 10,593 employees identified for the index year (employment as of March 1996) in the SWEIS.

Table 3.6-1. LANL-Affiliated Work Force

CATEGORY	UC EMPLOYEES	TECHNICAL CONTRACTOR	NON-TECHNICAL CONTRACTOR	JCNNM	PTLA	TOTAL
SWEIS ROD ^a	8740	795	Not projected ^b	1362	454	11,351
calendar year 1999	9185	1064	214	1461	488	12,412

^a Total number of employees was presented in the ROD, the breakdown had to be calculated based on the percentage distribution shown in the ROD for the base year.

^b Data were not presented for non-technical contractors or consultants.

This increase in employees has had a positive economic impact on northern New Mexico. Through 1998, DOE published a report each fiscal year regarding the economic impact of LANL on north-central New Mexico as well as the State of New Mexico (Lansford et al., 1997, 1998, and 1999). The findings of these reports indicate that LANL's activities resulted in a total increase in economic activity in New Mexico of about \$3.2 billion in 1996, \$3.9 billion in 1997, and \$3.8 billion in 1998. Based on number of employees and payroll, it is expected that LANL's 1999 economic contribution was similar to the previous three years.

The residential distribution of the new UC employees (e.g., the total 240 additional employees in 1999) reflects the housing market dynamics of three counties. As seen in Table 3.6-2, more than 90% of the UC employees continue to reside in the three counties of Los Alamos, Rio Arriba, and Santa Fe.

Table 3.6-2. County of Residence for UC Employees^a

CALENDAR YEAR	LOS ALAMOS	RIO ARRIBA	SANTA FE	OTHER NM	TOTAL NM	OUTSIDE NM	TOTAL
SWEIS ROD ^b	4279	1762	1678	671	8390	350	8740
calendar year 1999	4833	1523	1805	529	8690	495	9185

^a Includes both Regular and Temporary employees, including students who may not be at the Laboratory for much of the year.

^b Total number of employees was presented in the ROD, the breakdown had to be calculated based on the percentage distribution shown in the ROD for the base year.

Laboratory records contain the TA and building number of each employee's office. This information does not necessarily indicate where the employee actually performs his or her work; but rather, indicates where this employee gets mail and officially reports to duty. However, for purposes of tracking the dynamics of changes in employment across Key Facilities, this information provides a useful index. Table 3.6-3 identifies UC employees by Key Facility based on the facility definitions contained in the SWEIS. The employee numbers contained in the category "Rest of LANL," were calculated by subtracting the Key Facility numbers from the calendar year total.

The numbers in Table 3.6-3 cannot be directly compared to numbers in the SWEIS. The employee numbers for Key Facilities in the SWEIS represent total workforce, and include PTLA, JCNNM, and other subcontractor personnel. The new index (shown in Table 3.6-3) is based on routinely collected information and only represents full-time and part-time regular UC employees. It does not include employees on leave of absence, students (high school, cooperative, undergraduate, or graduate), or employees from special programs (i.e., limited-term or long-term visiting staff, post-doctorate, etc.). Because the two sets of numbers do not represent the same entity, a comparison to numbers in the SWEIS is not appropriate. This new index will be used throughout the lifetime of the Yearbook; hence, future comparisons and trending will be possible.

Table 3.6-3. UC Employee^a Index for Key Facilities

KEY FACILITY	CALENDAR YEAR 1999
Plutonium Complex	589
Tritium Facilities	28
CMR	204
Pajarito Site	70
Sigma Complex	101
MSL	57
Target Fabrication	54
Machine Shops	81
High Explosive Testing	227
High Explosive Processing	96
LANSCCE	560
HRL	98
Radiochemistry Laboratory	128
Waste Management – Radioactive Liquid Waste	62
Waste Management – Radioactive Solid and Chemical Waste	65
Rest of LANL	4601
Total Employees	7021

^a Includes full-time and part-time regular employees; it does not include students who may be at the Laboratory for much of the year nor does it include special programs personnel. This definition was incorrectly stated in the 1998 Yearbook. A similar index does not exist in the ROD, which used a very time-intensive method to calculate this index.

3.7 Land Resources

Land resources (i.e., undeveloped and developed lands) at LANL and the surrounding area had several changes during 1999. Major construction projects included the SCC, NISC, and IRP. Each of these projects had their own NEPA documentation. The SCC and NISC are being constructed in areas previously disturbed for parking lots or other structures. The IRP represents green-field construction and will ultimately result in a loss of about 30 acres. The remainder of the construction was done within existing facilities.

The SWEIS projected a habitat reduction of 41 acres under the Expanded Alternative because of the expansion of Area G. In 1999, this expansion was not undertaken.

In 1999, the only major construction project identified in the ROD outside of existing facilities at LANL was DAHRT. The actual habitat loss and ground breaking activities associated with this project happened during construction start-up in 1992 and 1993 when the land was cleared of vegetation and the “footprint” of this facility was established.

3.8 Groundwater

As projected by the ROD, water levels in supply wells penetrating into the regional aquifer continue to decline in response to pumping, typically by several feet each year. In areas where pumping is reduced, water levels show some recovery. No unexplained changes in patterns have occurred in the 1995–1999 period. Regionally, water levels in the aquifer have continued a gradual decline that started in about 1977.

Analysis of samples from the production wells showed that water quality continued to meet drinking water standards and continued to indicate no problematic trends. Water quality measurements for test wells, however, continue to show the presence of contamination from the Laboratory at the top of the regional aquifer, but at concentrations mostly below drinking water standards. In 1998, drilling of the characterization well R-25 at TA-16 revealed the presence of high explosives constituents at concentrations that are above the EPA Health Advisory guidance values for drinking water. Although the extent of high explosives constituents in the regional aquifer is presently unknown, continued testing in 1999 shows no high explosives constituents in water supply wells. Nitrate concentrations in TW-1 in Pueblo Canyon have been near the EPA maximum contaminant level since 1980. The source of the nitrate might be infiltration of sewage effluent in Pueblo Canyon, or it might be residual nitrates from the now-decommissioned TA-45 RLWTF that discharged into upper Pueblo Canyon until 1964.

Work underway as part of the Hydrogeologic Workplan provided new information on the regional aquifer and details of hydrogeologic conditions. By the end of 1999, four new wells had been drilled into the regional aquifer. Two were located near the eastern boundary of the Laboratory in Los Alamos Canyon (R-9) and Sandia Canyon (R-12). These two wells encountered several intermediate-depth perched zones of varying hydrologic and chemical quality. Both wells show that minor contamination has infiltrated from the surface into the perched zones and the uppermost regional aquifer.

R-25 was located near the western boundary in TA-16. This well encountered a thick perched zone at an elevation several hundred feet above the top of the regional aquifer. This perched zone was anticipated because



Well R-25, located near the western boundary of TA-16

of results of an earlier well drilled nearby. Based on preliminary findings in R-25, high explosives contaminants were found throughout the perched zone and also several hundred feet into the regional aquifer. The source of these contaminants is probably the discharge of high explosives wastewater at TA-16 since the late 1940s.

R-15 is located on the floor of Mortandad Canyon, approximately one mile upstream of the eastern Laboratory boundary. The well is downstream of the TA-50 RLWTF effluent discharge point. During drilling, tritium levels of approximately 4000 pCi/L were found in a perched groundwater zone at 646 feet, indicating Laboratory impacts. However, tritium levels of <3 pCi/L in the regional aquifer indicated no contamination. R-15 has been cased and developed.

None of the contaminants found in these new test wells exceed current drinking water standards. However, the uranium concentration in one perched zone in well R-9 is greater than the proposed EPA drinking water maximum concentration level, and TNT and RDX concentrations in well R-25 are greater than EPA Health Advisory values. Following the discovery of high explosives in well R-25, the nearest water supply wells were sampled and no high explosives contamination was detected (LANL 1999b).

These and other findings from the Hydrogeologic Workplan are adding to the understanding of the hydrologic setting at Los Alamos. Findings include (a) recognition of more perched zones above the regional aquifer than previously discovered; (b) confirmation that there is significant groundwater recharge along the flank of the Jemez Mountains; (c) recognition that there may be more groundwater recharge from canyon bottom alluvial groundwater than previously believed; and (d) the finding of Laboratory contaminants in perched zones and the regional aquifer at predicted locations where wells had not previously been drilled. These findings extend the areas that have been investigated by drilling, rather than change the picture of the hydrological system. Work continues under the Hydrogeologic Workplan to increase understanding of the hydrogeologic conditions and to ensure the safety of the drinking water supply.

3.9 Cultural Resources

The LANL site has a large number of diverse archaeological sites. Approximately 60% of LANL lands have been systematically surveyed and approximately 1600 archaeological sites have been identified in this process. Within LANL's limited access boundaries, there are ancestral villages, shrines, petroglyphs, sacred springs, trails, and traditional use areas that could be identified by Pueblo and Athabascan communities as traditional cultural properties.

The SWEIS reported 3668 inventoried resources. These resources included 1295 prehistoric resources (BC 4000–1600 AD), 87 historic homesteading and commercial resources (1600–1942 AD), 2232 World War II–Late Cold War era buildings and facilities (1943–1989 AD), and 54 areas within LANL identified by consulting communities (Native American pueblos, tribes, and local Hispanic communities) as having traditional cultural properties. Since the ROD, LANL surveys have identified an additional 91 archaeological sites (Table 3.9-1). All of these resources continue to be protected. No excavation of sites at TA-54 (as projected by the ROD) or at any other part of LANL has occurred. The following paragraphs provide details.

Table 3.9-1 Acreage Surveyed, Cultural Resource Sites Recorded, and Cultural Resource Sites Eligible for the National Register of Historic Places at LANL Fiscal Year 1999^a

FISCAL YEAR	TOTAL ACREAGE SURVEYED	TOTAL ACREAGE SURVEYED TO DATE	TOTAL ARCHAEOLOGIC AL SITES RECORDED TO DATE (CUMULATIVE)	NUMBER OF ELIGIBLE & POTENTIALLY ELIGIBLE NRHP ^b SITES	NUMBER OF NOTIFICATIONS TO INDIAN TRIBES
LANL SWEIS	Not reported	Not Reported	3668	1092	23
1999	1074	19,011	3759	1288	12

^a Source: The Secretary of Interior's Report to Congress on Federal Archaeological Activities. Information on LANL is from DOE/Los Alamos Area Office and LANL Cultural Resources Management Team.

^b NRHP is National Register of Historic Places.

The Laboratory and National Park Service continued a long-term monitoring program at the prehistoric pueblo of Nake'muu. This is the only pueblo within LANL that has standing walls. The pueblo's architecture has been mapped, photographed, and drawn to provide a baseline for comparison. This information is monitored on an annual basis, with continual assessments made of site condition, rate of deterioration, and possible sources of impact (e.g., vibrations from high explosives testing). An increased frequency in explosive testing at LANL presents a potential for shrapnel impacts and vibration damage to this sensitive cultural resource. Nake'muu will continue to be monitored for all types of deterioration or destruction, including monitoring the effects of explosives vibrations on the pueblo's walls.



Typical Mortandad Canyon
cavate petroglyph



Nake'muu—one of the best
preserved ruins at LANL

3.10 Ecological Resources

The historic presence of LANL, with its highly restricted access and other unique land use practices, continues to support a rich diversity of natural resources within northern New Mexico.

No significant adverse impacts to biological resources, ecological processes, or biodiversity, including threatened and endangered species, were projected by the ROD. Data collected for 1999 support this projection. These data are reported in the Environmental Surveillance Report for 1999 (LANL 2000b).

3.10.1 Threatened and Endangered Species Habitat Management Plan

The Threatened and Endangered Species Habitat Management Plan (HMP) received US Fish and Wildlife Service concurrence on February 12, 1999. The plan is used in project reviews to provide guidelines to project managers for assessing potential impact to Federally listed threatened and endangered species including the Mexican spotted owl, southwestern willow flycatcher, and bald eagle. The US Fish and Wildlife Service removed the American peregrine falcon from the endangered species list, and the HMP was updated to reflect this change. The HMP was incorporated into the NEPA, Cultural, and Biological Laboratory Implementing Requirements document developed during 1999.

In 1999, the Laboratory completed several contaminant studies and continued risk assessment studies on the food chain for threatened and endangered species inhabiting Laboratory lands. These studies included assessment of organic and metal contamination in the food chain for selected endangered species. Additional studies were done to assess the impact of burrowing animals on the redistribution of buried radioactive waste at Area G.



Biological field work

3.10.2 Biological Assessments

In January 1999, DOE submitted an amended biological assessment for the SWEIS to the US Fish and Wildlife Service for concurrence.

No floodplain and wetland assessments were conducted during 1999.

During 1999, the Laboratory also reviewed approximately 475 proposed activities and projects for potential impact on biological resources including Federal or State listed threatened and endangered species. These reviews evaluate the amount of previous development or disturbance at the proposed construction site to determine the presence of wetlands or floodplains in the project area, and to determine whether habitat evaluations or species-specific surveys are needed. The Laboratory adhered to protocols set by the US Fish and Wildlife Service and to permit requirements of the New Mexico State Game and Fish Department.



4.0 Additive Analysis

To enhance the usefulness of the Yearbook, data conducive to an additive analysis (i.e., the annual accumulation of radioactive waste compared to the capacity of Area G) or data that shows annual trends (i.e., decline in worker injuries over time) will be presented here. Full implementation of this section is anticipated in the 2000 Yearbook. The presentation made here is to demonstrate the type of analysis expected for the various parameters to be examined.

Solid Radioactive and Chemical Waste: Although the ROD identifies LLW and MLLW as the only waste types disposed on-site, LANL also disposes some solid wastes on-site. However, most chemical waste is shipped off-site to commercial treaters, disposers, or recyclers. Certain other wastes are held in storage pending availability of commercial treatment and disposal, development of appropriate technologies, or in the case of TRU and MTRU wastes, shipment to WIPP.

Existing capacity for LLW disposal at Area G was estimated at 36,000 cubic meters, and the Expanded Alternative estimated the need for disposal of 112,000 cubic meters. Thus, the ROD evaluated the need for an expansion of Area G to dispose the projected volume of LLW and identified several options, any of which would handle the estimated volumes of LLW.

As shown in Table 4.0-1, the cumulative waste volume is 3610 cubic meters or about 10% of the existing volume capacity of Area G.

Table 4.0-1 Cumulative LLW and MLLW Volumes

Waste Type	Units	SWEIS ROD	1998	1999	Cumulative Volume
LLW	m ³ /yr	12,200	1807	1710	3517
MLLW	m ³ /yr	632	72	21	93
Combined	m ³ /yr	12,832	1879	1731	3610



5.0 Summary and Conclusion

5.1 Summary

The SWEIS Yearbook for 1999 reviews calendar year 1999 operations for the 15 Key Facilities (as defined by the SWEIS) at LANL and compares those operations to levels projected by the ROD. The Yearbook also reviews the environmental parameters associated with operations at the same 15 Key Facilities and compares this data with ROD projections. In addition, the Yearbook presents a number of site-wide effects of those operations and environmental parameters. The more significant results presented in the Yearbook are as follows:

Facility Construction and Modifications: The ROD projected a total of 38 facility construction and modification projects for LANL facilities. Ten of these projects were listed only in the Expanded Operations Alternative, such as modifications at CMR for safety testing of pits in the Wing 9 hot cells, expansion of the LLW disposal area at TA-54, Area G, and the LPSS at TA-53. These ten projects could not proceed until DOE issued the ROD in September 1999. However, the remaining 28 construction projects were projected in the No Action Alternative. These included facility upgrades (e.g., safety upgrades at the CMR Building and process upgrades at the RLWTF), facility renovation (e.g., conversion of the former Rolling Mill, Building 03-141, to the BTF), and the erection of new storage domes at TA-54 for TRU wastes. Since these projects had independent NEPA documentation, they could proceed while the SWEIS was still in process.

Activities have proceeded on many of the 38 projects. Thirteen projects have now been completed, seven in 1999 and six in 1998. Additionally, another 10 projects were begun or continued in 1999. The seven projects completed in 1999 were

- replacement of the graphite collection systems at Sigma;
- modification of the industrial drain system at Sigma;
- replacement of electrical components at Sigma;
- relocation of the Weapons Components Testing Facility at High Explosives Processing;
- making LEDA operational;
- bringing the new UF/RO process on-line at RLWTF; and
- bringing the nitrate reduction equipment on-line at RLWTF.

In addition to facility modification and construction projects forecast by the ROD, several other projects were started during 1999. Four projects were in the construction phase: Atlas, the IRP, the SCC, and the NISC. The other project, the Central Health Physics Calibration Laboratory, was in the design phase. These are discussed in Chapter 2 of the Yearbook, along with references to the NEPA document (categorical exclusion or environmental assessment) that preceded the project.

Facility Operations: The SWEIS grouped LANL into 15 Key Facilities, identified the operations at each, and then projected the level of activity for each operation. These operations were grouped under 95 different capabilities for the Key Facilities. During 1999, there was activity under 90 of these capabilities. The five not used were Fabrication and Metallography at the CMR, ATW at LANSCE, Medical Isotope Production at LANSCE, Other Waste Processing at the Solid Radioactive and Chemical Waste Facility, and Size Reduction at the Solid Radioactive and Chemical Waste Facility.

While there was activity under nearly all capabilities, the levels of these activities were mostly below levels projected by the ROD. For example, the LANSCE linac generated an H⁺ proton beam for 2737 hours in 1999, at an average current of 93 microamps, compared to 6400 hours at 200 microamps projected by the ROD. Similarly, a total of 188 criticality experiments were conducted at Pajarito Site, compared to the 1050 projected experiments.

As in 1998, only three of LANL's facilities operated during 1999 at levels approximating those projected by the ROD—the MSL, the HRL, and the Non-Key Facilities. None of these facilities are major contributors to

parameters that lead to significant potential environmental impacts. The remaining 13 Key Facilities all conducted operations at or below projected activity levels.

Operations Data and Environmental Parameters: This 1999 Yearbook evaluates the effects of LANL operations in three general areas—effluents to the environment, workforce and regional consequences, and changes to environmental areas for which the DOE has stewardship responsibility as the owner of a large tract of land.

Effluents include air emissions, liquid effluents regulated through the NPDES program, and solid wastes. Radioactive air emissions totaled about 1900 curies compared to 21,700 projected by the ROD. This results in a hypothetical maximum dose to a member of the public of 0.32 millirem (compared to 5.44 projected). Calculated NPDES discharges totaled 317 million gallons compared to a projected volume of 278 million gallons per year. While the number of outfalls has been reduced, the methodology for calculating the discharges may result in an overestimate. For some facilities, outfall flows are recorded on a continuous basis; this was the case for outfalls at SWS, HEWTF, RLWTF, LANSCE, and the Power Plant. For all other outfalls, annual totals were calculated from average flows documented in the Laboratory's DMRs. The latter method substantially overestimates the quantity of wastewater discharged because it is based on infrequent sampling and the DMRs assume round-the-clock flow for all outfalls. As in the SWEIS Yearbook for 1998, operational knowledge relative to water supply wells and pump stations allowed more realistic estimates of flows for those outfalls by eliminating the need to assume 24-hour flow.

Solid radioactive and chemical wastes ranged from 3% (MLLW) to 475% (chemical waste) of projected quantities (see Table 3.3-1). These extremely large quantities of chemical waste are a result of ER Program activities (remediation of old MDAs). Most chemical wastes are shipped off-site for disposal at commercial facilities; therefore, these large quantities of chemical waste will not impact LANL environs. The one anomaly in 1999 is the 4003 cubic meters of solid wastes disposed in pits at Area J. These administratively controlled wastes resulted from ER Project remedial activities at MDA-P and far exceeded the projections of 100 cubic meters per year. However, this material was non-hazardous wastes, soil, concrete rubble, and debris placed in MDA-J as fill in preparation of capping (1999 Annual Report Questionnaire for the Los Alamos National Laboratory, Technical Area 54, Area J Landfill).

Workforce data were above projections. The 12,412 employees at the end of calendar year 1999 represent 1061 more employees than projected by the ROD. Thus, regional socioeconomic consequences, such as salaries and procurements, also should have exceeded projections.

Electricity use during 1999 totaled 369 gigawatt-hours with a peak demand of 68 megawatts, compared to projections of 782 gigawatt-hours and 113 megawatts. Water usage was 453 million gallons (compared to 759 million gallons projected), and natural gas consumption totaled 1.43 million decatherms (compared to 1.84 projected).

The collective TEDE for the LANL workforce during 1999 was 131 person-rem, considerably lower than the projected workforce dose of 704 person-rem.

Parameters of environmental stewardship were similar to (ecological resources and groundwater) or lower than (cultural resources and land use) ROD projections. For land use, the ROD projects the disturbance of 41 acres of new land at TA-54 because of the need for additional disposal cells for LLW. Through 1999, however, this expansion had not begun. Groundbreaking did occur on 30 acres of land that are being developed along West Jemez Road for the IRP. This project has its own NEPA documentation, and the land is being leased to Los Alamos County for this development.

Cultural resources remained protected, and no excavation of sites at TA-54 or any other part of LANL has occurred. (The ROD projected that 15 prehistoric sites would be affected by the expansion of Area G into Zones 4 and 6 at TA-54.)

As projected by the ROD, water levels in wells penetrating into the regional aquifer continue to decline in response to pumping, typically by several feet each year. In areas where pumping is reduced, water levels show

some recovery. No unexplained changes in patterns have occurred in the 1995–1999 period, and water levels in the regional aquifer have continued a gradual decline that started in about 1977.

Ecological resources continued to be enhanced as a result of protection afforded by DOE ownership of LANL. These resources include biological resources such as protected sensitive species, ecological processes, and biodiversity.

5.2 Conclusions

The data for 1999 reveal effects from LANL operations that are below levels projected by the SWEIS ROD. Site-wide, there are two main reasons for this fact. The ROD was not issued until September 1999; consequently operations were more likely to be at levels consistent with pre-ROD conditions. Moreover, data in the SWEIS were presented for the highest level projected over the ten-year period 1996–2005. Thus, the data from early years in the projection period (1999) would be expected to fall below the maximum.

One purpose of the 1999 Yearbook is to compare LANL operations and resultant 1999 data to the SWEIS in order to determine if LANL was still operating within the environmental envelope established by the SWEIS and the ROD. Data for 1999 indicate that positive impacts (such as socioeconomics) were greater than SWEIS projections, while negative impacts, such as radioactive air emissions and land disturbance, were, for the most part, within the SWEIS envelope.

5.3 To the Future

The Yearbook will continue to be prepared on an annual basis, with operations and relevant parameters in a given year compared to SWEIS projections for activity levels chosen by the ROD. The presentation proposed for the 2000 Yearbook will follow that developed for the previous Yearbooks—comparison to the ROD.

The 1999 Yearbook is an important step forward in fulfilling a commitment to make the SWEIS for LANL a living document. Future Yearbooks are planned to continue that role.





6.0 References

- Bertino 2000. Email from Paula Bertino to Chris Del Signore, Los Alamos, NM (10/4/2000).
- DOE 1992a. “Nuclear Safety Analysis Report,” DOE Order 5480.23, Washington, D.C. (04/10/92).
- DOE 1992b. “Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Report,” DOE Standard DOE-STD-1027-92, Washington, D.C. (12/92).
- DOE 1995. “Dual-Axis Radiographic Hydrodynamic Test Facility Final Environmental Impact Statement,” DOE/EIS-0228, Albuquerque, NM (08/95).
- DOE 1996a. “Environmental Assessment for Effluent Reduction,” DOE/EA-1156, Los Alamos, NM (09/11/96).
- DOE 1996b. “Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management,” Appendix K, “Atlas Facility Project-Specific Analysis,” DOE/EIS-0236, Washington, D.C. (09/96).
- DOE 1997a. “Relocation of Radiography at TA-16,” LAN-97-036, Los Alamos, NM (01/16/97).
- DOE 1997b. “Environmental Assessment for the Lease of Land for the Development of a Research Park at Los Alamos National Laboratory,” DOE/EA-1212, Los Alamos, NM (10/07/97).
- DOE 1998a. “DOE List of Los Alamos National Laboratory Nuclear Facilities,” DOE Albuquerque Operations Office Memorandum (12/98).
- DOE 1998b. “Environmental Assessment for the Proposed Strategic Computing Complex, Los Alamos National Laboratory, Los Alamos, New Mexico,” DOE/EA-1250 (12/18/98).
- DOE 1999a. “Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory,” DOE/EIS-0238, Albuquerque, NM (01/99).
- DOE 1999b. “Record of Decision: SWEIS in the State of New Mexico,” 64FR50797, Washington, D.C. (09/19/99).
- DOE 1999c. “HE Formulation Relocation from TA-16-340 to TA-9-39 & Bldg. 45,” LAN-99-042a, Los Alamos, NM (05/12/99).
- DOE 1999d. “Decontamination and Volume Reduction System for Transuranic Waste at Los Alamos National Laboratory,” DOE/EA-1269, Los Alamos, NM.
- DOE 1999e. “Environmental Assessment for Nonproliferation and International Security Center,” DOE/EA-1247, Los Alamos, NM (07/21/99).
- Jacobson 2000. Jacobson, Kieth. “US Department of Energy Report 1999 LANL Radionuclide Air Emissions,” LA-13732-ENV, Los Alamos, NM.
- LANL 1998a. “NEPA Categorical Exclusion for Facilities Improvement Technical Support (FITS) Building,” LAN-97-013A, Los Alamos, NM (2/5/98, amended 1/19/99).
- LANL 1998b. “NEPA Categorical Exclusion for HE Wastewater Collection System Repairs, TA-9-21,” LAN-96-012, Los Alamos, NM (10/6/98).

- LANL 1998c. "NEPA Categorical Exclusion for the Applied Research, Optics, and Electronics (AROE) Laboratory," LAN-98-101, Los Alamos, NM (10/3/98).
- LANL 1999a. "Comprehensive Site Plan 2000 (Draft)," Chapter VIII, "Projects," Los Alamos, NM.
- LANL 1999b. "Groundwater Annual Status Report for FY 1998," Los Alamos, NM (03/23/99).
- LANL 2000a. "Emissions Inventory Report Summary, Reporting Requirements for the New Mexico Administrative Code, Title 20, Chapter 2, Part 73 for Calendar Year 1999," LA-13728-PR, Los Alamos, NM.
- LANL 2000b. "Environmental Surveillance at Los Alamos During 1999," LA-13775-ENV, Los Alamos, NM (12/00).
- LANL 2000c. "1999 RCRA Hazardous Waste Biennial Report," Los Alamos, NM.
- Lansford, Robert, Larry Adcock, Shaul Ben-David, and John Temple. 1997. "The Economic Impact of Los Alamos National Laboratory on North-Central New Mexico and the State of New Mexico Fiscal Year 1996," New Mexico State University; prepared for the US Department of Energy (06/97).
- Lansford, Robert, Larry Adcock, Shaul Ben-David, and John Temple. 1998. "The Economic Impact of Los Alamos National Laboratory on North-Central New Mexico and the State of New Mexico Fiscal Year 1997," New Mexico State University; prepared for the US Department of Energy (05/98).
- Lansford, Robert, Larry Adcock, Shaul Ben-David, and John Temple. 1999. "The Economic Impact of Los Alamos National Laboratory on North-Central New Mexico and the State of New Mexico Fiscal Year 1998," New Mexico State University; prepared for the US Department of Energy (08/99).
- Sandoval 2000. Email from Tina M. Sandoval to Chris Del Signore, Los Alamos, NM (04/07/00).
- Shaull, David A., Michael R. Alexander, Robin P. Reynolds, Christopher T. McLean, Ryan P. Romero. 2000. "Surface Water Data at Los Alamos National Laboratory: 1999 Water Year," LA-137076-PR, Los Alamos, NM.

Appendix: Chemical Usage and Estimated Emissions Data

Table A-1. Comparison of Chemicals used in 1995 and 1999

TECHNICAL AREA	NUMBER OF CHEMICALS USED IN 1995 BUT NOT IN 1999	NUMBER OF CHEMICALS USED IN 1999 BUT NOT IN 1995
03	107	8
08	6	3
09	34	11
15	8	2
16	35	9
18	12	4
21	119	3
35	134	8
39	10	0
40	3	3
43	18	19
48	61	22
50	12	13
53	8	0
54	46	0
55	92	1

Table A-2. Chemical and Metallurgy Research Building

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
Chemistry and Metallurgy Research Building				
	Acetic Acid	kg/yr	0.2	0.5
	Acetone	kg/yr	2.5	7.1
	Ammonium Chloride (Fume)	kg/yr	0.3	0.8
	Diethylene Triamine	kg/yr	0.3	1.0
	Ethanol	kg/yr	3.1	9.0
	Formic Acid	kg/yr	10.0	28.7
	Hydrogen Bromide	kg/yr	1.6	4.5
	Hydrogen Chloride	kg/yr	43.2	123.4
	Hydrogen Fluoride, as F	kg/yr	0.3	0.7
	Hydrogen Peroxide	kg/yr	24.1	68.9
	Magnesium Oxide Fume	kg/yr	0.4	1.0
	Methyl Alcohol	kg/yr	0.1	0.4
	n-Amyl Acetate	kg/yr	0.2	0.4
	Phosphoric Acid	kg/yr	9.6	27.5
	Potassium Hydroxide	kg/yr	16.9	48.3
	Propane	kg/yr	0.0	219.3
	Sulfuric Acid	kg/yr	70.8	202.4

A total of 17 of the listed chemicals were used at the CMR in 1999. The amount of propane combusted at the facility totaled 484 pounds (219 kg).

Table A-3. High Explosives Processing Facilities

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
High Explosives Processing Facilities				
	Acetic Acid	kg/yr	14.7	42.0
	Acetone	kg/yr	66.4	189.8
	Acetonitrile	kg/yr	16.2	46.3
	Acetylene	kg/yr	7.7	22.0
	Carbon Black	kg/yr	0.4	1.0
	Chlorodifluoromethane	kg/yr	168.3	480.8
	Chloroform	kg/yr	1.0	3.0
	Chromic acids & chromates	kg/yr	0.2	0.5
	Copper	kg/yr	0.0	0.5
	Cyclohexane	kg/yr	0.1	0.4
	Cyclohexanone	kg/yr	0.3	0.9
	Dichlorodifluoromethane	kg/yr	0.1	0.2
	Ethanol	kg/yr	174.6	498.7
	Ethyl Ether	kg/yr	1.5	4.2
	Ethylene Dichloride	kg/yr	8.6	24.7
	Hydrogen Chloride	kg/yr	11.9	34.1
	Hydrogen Fluoride, as F	kg/yr	0.2	0.4
	Hydrogen Peroxide	kg/yr	15.8	45.0
	Isopropyl Alcohol	kg/yr	5.5	15.6
	Mercury numerous forms	kg/yr	0.3	29.0
	Methyl Alcohol	kg/yr	37.3	106.4
	Methyl Cyclohexane	kg/yr	0.3	0.8
	Methyl Ethyl Ketone (MEK)	kg/yr	169.7	484.9
	Methylene Chloride	kg/yr	7.4	21.2
	n,n-Dimethylformamide	kg/yr	4.0	11.4
	Nitric Oxide	kg/yr	2.7	7.6
	Nitrous Oxide	kg/yr	3.9	11.1
	Phenol	kg/yr	0.4	1.0
	Propane	kg/yr	0.0	4396.2
	Propyl Alcohol	kg/yr	1.4	4.0
	Silver (metal dust & soluble comp., as Ag)	kg/yr	0.1	6.2
	Sulfur Hexafluoride	kg/yr	1.6	4.6
	Sulfuric Acid	kg/yr	2.6	7.4
	Tetrahydrofuran	kg/yr	21.5	61.4
	Thionyl Chloride	kg/yr	0.2	0.5
	Toluene	kg/yr	5.3	15.1
	Turpentine	kg/yr	1.1	3.2
	Xylene (o-,m-,p-Isomers)	kg/yr	0.3	0.8
	Zinc Oxide Fume	kg/yr	0.8	2.3

A total of 39 of the listed chemicals were used in High Explosives Processing in 1999. The amount of propane combusted at the facility totaled 9692 pounds (4396 kg).

Table A-4. High Explosives Testing Facilities

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
High Explosives Testing Facilities				
	Acetone	kg/yr	0.8	2.4
	Acetylene	kg/yr	2.8	7.9
	Ethanol	kg/yr	2.2	6.3
	Methyl Alcohol	kg/yr	1.1	3.2
	Methyl Ethyl Ketone (MEK)	kg/yr	0.3	0.8
	Methylene Chloride	kg/yr	0.5	1.3
	Nitromethane	kg/yr	0.1	0.2
	Propane	kg/yr	0.0	296.9
	Stoddard Solvent	kg/yr	0.3	0.7

A total of 9 of the listed chemicals were used in High Explosives Testing in 1999. The amount of propane combusted at the facility totaled 655 pounds (297 kg).

Table A-5. HRL

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
HRL				
	1,4-Dioxane	kg/yr	0.4	1.0
	2-Methoxyethanol (EGME)	kg/yr	0.2	0.5
	Acetic Acid	kg/yr	4.0	11.5
	Acetic Anhydride	kg/yr	8.4	24.1
	Acetone	kg/yr	10.6	30.4
	Acetonitrile	kg/yr	231.6	661.6
	Acrylamide	kg/yr	0.6	1.6
	Ammonium Chloride (Fume)	kg/yr	0.6	1.6
	Catechol	kg/yr	0.7	2.0
	Chloroform	kg/yr	2.6	7.6
	Chromic acids & chromates	kg/yr	1.3	3.8
	Cyclohexane	kg/yr	0.1	0.4
	Ethanol	kg/yr	94.2	269.1
	Ethanolamine	kg/yr	0.7	2.0
	Ethyl Ether	kg/yr	2.9	8.4
	Ethylene Diamine	kg/yr	4.2	12.0
	Formamide	kg/yr	5.2	14.9
	Hexane (other isomers)* or n-Hexane	kg/yr	0.3	1.0
	Hexylene Glycol	kg/yr	0.1	0.4
	Hydrogen Chloride	kg/yr	2.1	5.9
	Hydrogen Fluoride, as F	kg/yr	0.2	0.5
	Hydrogen Peroxide	kg/yr	0.5	1.4
	Iso-Amyl Alcohol	kg/yr	0.7	2.0
	Isopropyl Alcohol	kg/yr	21.9	62.4
	Mercury numerous forms	kg/yr	0.0	0.5
	Methyl Alcohol	kg/yr	28.5	81.3
	Methylene Chloride	kg/yr	16.9	48.4
	n,n-Dimethylformamide	kg/yr	0.6	1.6
	n-Butyl Alcohol	kg/yr	0.6	1.6
	Paraffin Wax Fume	kg/yr	0.2	0.5
	Phenol	kg/yr	1.9	5.6
	Phosphoric Acid	kg/yr	1.0	3.0
	Potassium Hydroxide	kg/yr	0.2	0.5
	sec-Butyl Alcohol	kg/yr	0.1	0.4
	Sulfuric Acid	kg/yr	1.7	4.8
	Tetrahydrofuran	kg/yr	17.2	49.2
	Tetrasodium Pyrophosphate	kg/yr	0.2	0.5
	Trichloroacetic Acid	kg/yr	4.9	14.0
	Xylene (o-,m-,p-Isomers)	kg/yr	0.2	0.4
	Zinc Chloride Fume	kg/yr	0.4	1.2

A total of 40 of the listed chemicals were used at the HRL in 1999.

Table A-6. LANSCE

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
LANSCE				
	1,1,1-Trichloroethane	kg/yr	97.8	279.4
	2-Butoxyethanol	kg/yr	0.2	0.5
	Acetone	kg/yr	177.0	505.6
	Acetylene	kg/yr	736.5	2104.4
	Benzene	kg/yr	0.3	0.9
	Carbon Disulfide	kg/yr	0.4	1.3
	Carbon Tetrachloride	kg/yr	3.3	9.6
	Chlorodifluoromethane	kg/yr	8440.3	24115.2
	Cyclohexane	kg/yr	0.3	0.8
	Dichlorodifluoromethane	kg/yr	1.5	4.4
	Diethanolamine	kg/yr	0.2	0.5
	Ethanol	kg/yr	197.9	565.4
	Ethylene Dichloride	kg/yr	0.4	1.1
	Iron Oxide Fume, as Fe	kg/yr	0.2	0.5
	Isobutane	kg/yr	19.2	55.0
	Isopropyl Alcohol	kg/yr	7.3	20.8
	Mercury numerous forms	kg/yr	26.1	2612.7
	Methyl Alcohol	kg/yr	3.6	10.3
	Methylene Chloride	kg/yr	0.5	1.3
	n-Butyl Acetate	kg/yr	0.2	0.4
	Phosphoric Acid	kg/yr	0.3	0.9
	Potassium Hydroxide	kg/yr	0.2	0.5
	Propane	kg/yr	0.0	3797.7
	Silver (metal dust & soluble comp., as Ag)	kg/yr	0.0	0.5
	Sulfur Hexafluoride	kg/yr	0.2	0.7
	Sulfuric Acid	kg/yr	1.9	5.5
	Toluene	kg/yr	0.2	0.4
	Tungsten as W insoluble Compounds	kg/yr	7.3	732.5
	Zinc Chromate, as Cr	kg/yr	0.4	1.1

A total of 29 of the listed chemicals were used at LANSCE in 1999. The amount of propane combusted at the facility totaled 8373 pounds (3798 kg).

Table A-7. Machine Shops

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
Machine Shops				
	Isopropyl Alcohol	kg/yr	1.1	3.1
	Propane	kg/yr	0.0	593.8

A total of 2 of the listed chemicals were used at the machine shops in 1999. The amount of propane combusted at the facility totaled 1309 pounds (594 kg).

Table A-8. Material Science Laboratory

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
Material Science Laboratory				
	1,1,2,2-Tetrachloroethane	kg/yr	1.1	3.2
	1,1,2-Trichloro-1,2,2-Trifluoroethane	kg/yr	0.5	1.6
	2-Methoxyethanol (EGME)	kg/yr	0.7	1.9
	Acetic Acid	kg/yr	0.2	0.5
	Acetone	kg/yr	3.6	10.3
	Aluminum numerous forms	kg/yr	0.0	2.2
	Ammonia	kg/yr	0.1	0.3
	Benzene	kg/yr	0.3	0.9
	Biphenyl	kg/yr	0.4	1.0
	Chlorobenzene	kg/yr	1.5	4.4
	Chloroform	kg/yr	1.0	3.0
	Copper	kg/yr	0.1	6.8
	Diethylene Triamine	kg/yr	0.2	0.5
	Ethanol	kg/yr	4.0	11.3
	Ethyl Acetate	kg/yr	1.3	3.6
	Ethylene Chlorohydrin	kg/yr	0.1	0.3
	Hydrogen Bromide	kg/yr	0.2	0.5
	Hydrogen Chloride	kg/yr	0.6	1.8
	Hydrogen Fluoride, as F	kg/yr	0.2	0.7
	Hydrogen Peroxide	kg/yr	0.5	1.4
	Isopropyl Alcohol	kg/yr	4.4	12.6
	Methyl Alcohol	kg/yr	3.3	9.5
	Methylene Chloride	kg/yr	0.5	1.3
	Molybdenum	kg/yr	0.0	0.5
	n,n-Dimethylformamide	kg/yr	0.2	0.5
	n-Butyl Acetate	kg/yr	0.2	0.4
	n-Butyl Alcohol	kg/yr	0.3	0.8
	Phenol	kg/yr	0.2	0.5
	Phosphorus Oxychloride	kg/yr	0.1	0.3
	Potassium Hydroxide	kg/yr	3.5	10.0
	Pyridine	kg/yr	0.7	1.9
	Silica, Quartz	kg/yr	1.3	3.6
	Silver (metal dust & soluble comp., as Ag)	kg/yr	0.0	0.8

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
Material Science Laboratory				
	Styrene	kg/yr	0.3	0.9
	Sulfuric Acid	kg/yr	2.6	7.4
	tert-Butyl Alcohol	kg/yr	0.3	0.8
	Toluene-2,4-diisocyanate (TDI)	kg/yr	0.6	1.6
	Vanadium, Respirable Dust & Fume	kg/yr	0.0	0.5
	Zinc Chloride Fume	kg/yr	0.4	1.0
	Zirconium Compounds, as Zr	kg/yr	0.0	0.3

A total of 40 of the listed chemicals were used at the in 1999.

Table A-9. Pajarito Site

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
Pajarito Site				
	Ethanol	kg/yr	0.1	0.4
	Isopropyl Alcohol	kg/yr	1.6	4.7
	Magnesium Oxide Fume	kg/yr	15.9	45.4
	Phenylphosphine	kg/yr	6.6	18.9
	Propane	kg/yr	0.0	1050.2
	Xylene (o-,m-,p-Isomers)	kg/yr	0.3	0.8

A total of 6 of the listed chemicals were used at Pajarito Site in 1999. The amount of propane combusted at the facility totaled 2315 pounds (1050 kg).

Table A-10. Plutonium Facility Complex

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
Plutonium Facility Complex				
	Acetic Acid	kg/yr	14.7	42.0
	Acetylene	kg/yr	2.8	7.9
	Ethanol	kg/yr	59.0	168.6
	Hydrogen Chloride	kg/yr	311.6	890.3
	Hydrogen Peroxide	kg/yr	45.5	130.1
	Iron Oxide Fume, as Fe	kg/yr	0.1	0.3
	Methyl 2-Cyanoacrylate	kg/yr	0.5	1.5
	Methyl Ethyl Ketone (MEK)	kg/yr	5.3	15.2
	n,n-Dimethylformamide	kg/yr	1.3	3.8
	Potassium Hydroxide	kg/yr	245.5	701.5
	Sulfuric Acid	kg/yr	36.7	104.9
	Trichloroethylene	kg/yr	114.9	328.3

A total of 12 of the listed chemicals were used at the Plutonium Facility Complex in 1999

Table A-11. Radiochemistry Laboratory

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
Radiochemistry Laboratory				
	1,1,1-Trichloroethane	kg/yr	2.3	6.7
	1,1,2-Trichloro-1,2,2-Trifluoroethane	kg/yr	2.2	6.3
	1,3,5-Trimethylbenzene	kg/yr	0.2	0.5
	1,3-Butadiene	kg/yr	5.3	15.0
	1,4-Dioxane	kg/yr	0.4	1.0
	2-Methoxyethanol (EGME)	kg/yr	0.2	0.5
	Acetic Acid	kg/yr	1.9	5.5
	Acetic Anhydride	kg/yr	0.8	2.2
	Acetone	kg/yr	90.9	259.8
	Ammonium Chloride (Fume)	kg/yr	0.8	2.3
	Arsenic, el.&inorg.,exc. Arsine, as As	kg/yr	0.4	1.1
	Benzene	kg/yr	0.8	2.2
	Benzyl Chloride	kg/yr	0.2	0.5
	Bromine	kg/yr	0.3	0.8
	Carbon Tetrachloride	kg/yr	64.5	184.2
	Chlorine	kg/yr	0.3	0.9
	Chloroform	kg/yr	5.5	15.6
	Chromium, Metal &Cr III Compounds, as Cr	kg/yr	0.3	0.7
	Cobalt, elemental & inorg.comp., as Co	kg/yr	0.3	0.9
	Cyclohexylamine	kg/yr	0.3	0.8
	Diethanolamine	kg/yr	2.3	6.7
	Diethylamine	kg/yr	0.5	1.5
	Ethanol	kg/yr	10.0	28.6
	Ethyl Acetate	kg/yr	8.8	25.2
	Ethyl Chloride	kg/yr	0.4	1.0
	Ethyl Ether	kg/yr	4.4	12.6
	Ethylene Diamine	kg/yr	0.2	0.5
	Ethylene Dichloride	kg/yr	0.9	2.5
	Furfural	kg/yr	0.2	0.6
	Hexafluoroacetone	kg/yr	0.3	0.7
	Hexane (other isomers)* or n-Hexane	kg/yr	11.2	32.0
	Hydrogen Bromide	kg/yr	4.3	12.3
	Hydrogen Chloride	kg/yr	211.8	605.0
	Hydrogen Fluoride, as F	kg/yr	3.2	9.0
	Hydrogen Peroxide	kg/yr	11.6	33.1
	Indene	kg/yr	0.1	0.3
	Iron Oxide Fume, as Fe	kg/yr	0.4	1.0
	Isopropyl Alcohol	kg/yr	8.0	22.8

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
	Isopropyl Ether	kg/yr	0.1	0.3
	Kerosene	kg/yr	0.0	3.0
	Magnesium Oxide Fume	kg/yr	0.4	1.1
	Mercury numerous forms	kg/yr	0.0	0.5
	Methyl Alcohol	kg/yr	11.1	31.7
	Methyl Ethyl Ketone (MEK)	kg/yr	0.3	0.8
	Methyl Formate	kg/yr	0.4	1.0
	Methyl Iodide	kg/yr	0.4	1.0
	Methylene Chloride	kg/yr	13.9	39.8
	Molybdenum	kg/yr	0.0	1.0
	n,n-Dimethylformamide	kg/yr	1.0	2.8
	Nitric Oxide	kg/yr	1.5	4.2
	Nitromethane	kg/yr	0.2	0.6
	Nitrous Oxide	kg/yr	0.1	0.2
	p-Phenylenediamine	kg/yr	0.2	0.5
	Pentane (all isomers)	kg/yr	0.9	2.5
	Phosphoric Acid	kg/yr	2.6	7.3
	Phosphorus Trichloride	kg/yr	0.1	0.3
	Potassium Hydroxide	kg/yr	1.7	4.7
	Propane	kg/yr	0.0	1769.7
	Pyridine	kg/yr	0.8	2.4
	Silver (metal dust & soluble comp., as Ag)	kg/yr	0.0	0.4
	Sulfuric Acid	kg/yr	12.2	35.0
	tert-Butyl Alcohol	kg/yr	0.1	0.4
	Tetrahydrofuran	kg/yr	5.6	16.0
	Thionyl Chloride	kg/yr	0.7	1.9
	Toluene	kg/yr	17.7	50.7
	Trichloroethylene	kg/yr	0.3	0.7
	Triethylamine	kg/yr	0.8	2.3
	Uranium (natural) Sol.&Unsol.Comp. as U	kg/yr	0.7	1.9
	Vinyl Acetate	kg/yr	0.3	0.9

A total of 69 of the listed chemicals were used at the Radiochemistry Laboratory in 1999. The amount of propane combusted at the facility totaled 3902 pounds (1770 kg).

Table A-12. Sigma Complex

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
Sigma Complex				
	2-Butoxyethanol	kg/yr	1.3	3.6
	Acetone	kg/yr	8.0	22.9
	Acetylene	kg/yr	11.0	31.6
	Aluminum numerous forms	kg/yr	0.1	11.8
	Ammonia	kg/yr	0.2	0.5
	Cadmium, el.&compounds, as Cd	kg/yr	0.0	0.5
	Chloroform	kg/yr	0.3	0.7
	Chromium, Metal &Cr III Compounds, as Cr	kg/yr	0.0	4.0
	Copper	kg/yr	0.6	56.6
	Diethylene Triamine	kg/yr	0.7	1.9
	Ethanol	kg/yr	15.2	43.5
	Hydrazine	kg/yr	0.1	0.3
	Hydrogen Chloride	kg/yr	5.4	15.4
	Hydrogen Fluoride, as F	kg/yr	64.9	185.4
	Hydrogen Peroxide	kg/yr	1.3	3.7
	Isopropyl Alcohol	kg/yr	9.9	28.3
	Kerosene	kg/yr	0.0	21.4
	Methyl Alcohol	kg/yr	4.6	13.1
	Methyl Ethyl Ketone (MEK)	kg/yr	0.3	0.8
	Methylene Chloride	kg/yr	0.2	0.7
	Molybdenum	kg/yr	3.9	387.1
	Nickel, metal (dust) or Soluble & Inorganic Comp.	kg/yr	0.0	4.0
	Phosphoric Acid	kg/yr	234.3	669.3
	Potassium Hydroxide	kg/yr	0.8	2.3
	Silica, Quartz	kg/yr	0.7	2.0
	Sulfuric Acid	kg/yr	25.5	72.8
	Tantalum Metal	kg/yr	0.3	27.2
	Tin numerous forms	kg/yr	0.0	1.1
	Xylene (o-,m-,p-Isomers)	kg/yr	1.7	4.9
	Zinc Oxide Fume	kg/yr	0.2	0.5
	Zirconium Compounds, as Zr	kg/yr	0.0	1.0

A total of 31 of the listed chemicals were used at the Sigma Complex in 1999.

Table A-13. Target Fabrication Facility

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
Target Fabrication Facility				
	1,1,1-Trichloroethane	kg/yr	4.9	14.1
	1,1,2-Trichloroethane	kg/yr	0.5	1.4
	2-Methoxyethanol (EGME)	kg/yr	0.3	1.0
	Acetone	kg/yr	20.0	57.2
	Acrylic Acid	kg/yr	0.2	0.6
	Acrylonitrile	kg/yr	0.3	0.8
	Ammonia	kg/yr	1483.5	4238.6
	Ammonium Chloride (Fume)	kg/yr	0.4	1.0
	Aniline & Homologues	kg/yr	0.2	0.5
	Chlorine	kg/yr	6.9	19.7
	Cyclohexane	kg/yr	0.5	1.6
	Dibutyl Phthalate	kg/yr	0.7	2.1
	Diethanolamine	kg/yr	0.2	0.5
	Diethyl Phthalate	kg/yr	0.1	0.4
	Diethylene Triamine	kg/yr	0.3	1.0
	Ethanol	kg/yr	9.1	25.9
	Ethyl Acetate	kg/yr	1.3	3.6
	Ethylene Diamine	kg/yr	0.2	0.4
	Ethylene Dichloride	kg/yr	2.4	6.8
	Hydrogen Chloride	kg/yr	3.9	11.0
	Hydrogen Fluoride, as F	kg/yr	0.3	1.0
	Hydrogen Peroxide	kg/yr	0.2	0.7
	Isopropyl Alcohol	kg/yr	6.9	19.6
	Methyl Alcohol	kg/yr	12.1	34.7
	Methyl Cyclohexane	kg/yr	0.3	0.8
	Methyl Isobutyl Ketone	kg/yr	0.1	0.4
	Methylene Chloride	kg/yr	1.9	5.3
	n,n-Dimethyl Acetamide or Dimethyl Acetamide	kg/yr	0.3	0.9
	n,n-Dimethylformamide	kg/yr	12.3	35.1
	n-Amyl Acetate	kg/yr	0.3	0.9
	n-Butyl Acetate	kg/yr	0.2	0.4
	n-Heptane	kg/yr	1.0	2.7
	Nitrous Oxide	kg/yr	19.3	55.0
	Osmium Tetroxide, as Os	kg/yr	0.1	0.2
	Phosphoric Acid	kg/yr	0.4	1.0
	Potassium Hydroxide	kg/yr	0.4	1.0
	Propane	kg/yr	0.0	45.4
	Propyl Alcohol	kg/yr	0.3	0.8
	Silicon Tetrahydride	kg/yr	3.1	8.9
	Styrene	kg/yr	1.7	4.9
	Sulfur Hexafluoride	kg/yr	9.7	27.7
	Sulfuric Acid	kg/yr	4.8	13.8
	Tetrahydrofuran	kg/yr	0.3	0.9
	Toluene	kg/yr	1.2	3.5

A total of 44 of the listed chemicals were used at the Target Fabrication Facility in 1999. The amount of propane combusted at the facility totaled 100 pounds (45 kg).

Table A-14. Tritium Facility

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
Tritium Facilities				
	Ammonia	kg/yr	0.8	2.4
	Copper	kg/yr	0.0	0.5
	Ethanol	kg/yr	0.3	0.7
	Hydrogen Chloride	kg/yr	0.4	1.2
	Methyl Alcohol	kg/yr	0.3	0.8
	Phenylphosphine	kg/yr	0.3	0.9
	Propane	kg/yr	0.0	73.4
	Sulfur Hexafluoride	kg/yr	14.2	40.6

A total of 8 of the listed chemicals were used at the Tritium Facilities in 1999. The amount of propane combusted at the facility totaled 162 pounds (73 kg).

Table A-15. Waste Management Operations: Radioactive Liquid Waste Treatment Facility

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
Waste Management Operations: Radioactive Liquid Waste Facility				
	1,1,2-Trichloro-1,2,2-Trifluoroethane	kg/yr	1.4	4.0
	Acetic Acid	kg/yr	17.7	50.5
	Acetone	kg/yr	0.8	2.4
	Acetonitrile	kg/yr	0.3	0.8
	Acetylene	kg/yr	6.9	19.7
	Ammonium Chloride (Fume)	kg/yr	0.2	0.7
	Cadmium, el.&compounds, as Cd	kg/yr	0.2	22.7
	Carbon Black	kg/yr	0.6	1.6
	Hexane (other isomers)* or n-Hexane	kg/yr	1.8	5.3
	Hydrogen Chloride	kg/yr	88.0	251.4
	Hydrogen Fluoride, as F	kg/yr	0.7	2.0
	Hydrogen Peroxide	kg/yr	11.8	33.8
	Magnesium Oxide Fume	kg/yr	0.2	0.5
	Methyl 2-Cyanoacrylate	kg/yr	0.1	0.3
	Methyl Alcohol	kg/yr	1.9	5.5
	Oxalic Acid	kg/yr	0.2	0.5
	Phenol	kg/yr	0.7	2.0
	Phosphorus	kg/yr	0.2	0.6
	Potassium Hydroxide	kg/yr	3.3	9.5
	Propane	kg/yr	0.0	12340.9
	Propyl Alcohol	kg/yr	0.1	0.4
	Silica, Quartz	kg/yr	1.1	3.0

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
	Silver (metal dust & soluble comp., as Ag)	kg/yr	0.0	1.1
	Sulfuric Acid	kg/yr	152.6	435.9
	Tin numerous forms	kg/yr	0.0	0.7
	Trichloroacetic Acid	kg/yr	0.2	0.5
	Zinc Chloride Fume	kg/yr	0.2	0.5

A total of 27 of the listed chemicals were used in Waste Management Operations in 1999. The amount of propane combusted at the facility totaled 27207 pounds (12341 kg).

Table A-16. Waste Management Operations: Solid Radioactive and Chemical Waste Facilities

KEY FACILITY	CHEMICAL NAME	UNIT OF MEASURE	1999 ESTIMATED AIR EMISSIONS	1999 USAGE
WMO: solid rad and chem				
	Diethanolamine	kg/yr	0.2	0.5
	Ethanol	kg/yr	14.9	42.6
	Hydrogen Chloride	kg/yr	6.9	19.6
	Methyl Alcohol	kg/yr	1.4	4.0
	Propane	kg/yr	0.0	1675.0
	Sulfuric Acid	kg/yr	0.6	1.8

A total of 6 of the listed chemicals were used in WMO in 1999. The amount of propane combusted at the facility totaled 3693 pounds (1675 kg).





To obtain a copy of the SWEIS Yearbook —1999, contact Doris Garvey, Project Leader, Site-Wide Issues Office, P.O. Box 1663, MS M889, Los Alamos, New Mexico 87545. This 1999 Yearbook is available on the web at: <http://lib-www.lanl.gov/la-pubs/00393813.pdf>

The Site-Wide Issues Office and the Environmental Publications and Design Team of the Ecology Group (ESH-20) coordinated production of this booklet.

Lead Writers: Doris Garvey and Ken Rea

Editor: Hector Hinojosa, IM-1

Designer: Randy Summers, IM-1

Printing coordinator: Lupe Archuleta, IM-4

Photos

RN83124001	xii	P6130035	3-19
82039k014	1-2	P6200077	3-19
RN991723	2-6	P6200079	3-19
RN991728	2-11	P8090716	3-20
RN991770	2-11	P6300197	3-20
RN991724	2-17	P8150788	3-20
RN00212007	2-22	P8290958	3-20
di000686001	2-33	P9271313	3-20
di000845	2-49	RN94085001	4-2
RN00134036	2-49	RN94085006	5-4
di990719	3-12	di991637	Above

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by the University of California for the US Department of Energy under contract W-7405-ENG-36. By acceptance of this article, the publisher recognizes that the US Government retains a nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for US Government purposes. Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the US Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.



Los Alamos

NATIONAL LABORATORY

Los Alamos, New Mexico 87545

A U.S. Department of Energy Laboratory